ELECTRICAL REVIEW

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30th April, 1948

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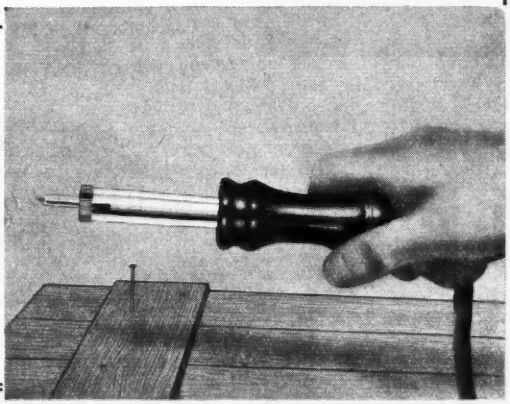

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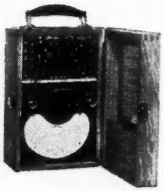

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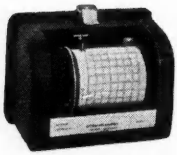

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

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Rising Exports

Electrical Industry's Achievements and Potentiality

LAST month exports from the United Kingdom reached the highest level (in value) since July, 1920; in volume they were about 130 per cent of the 1938 monthly average. The substantial increase since the last quarter of 1947 gives rise to hopes that the Government's aims of 40 per cent above the 1938 average by June and 50 per cent by the end of the year may be realized.

Even so, satisfaction must be considerably lessened by contemplation of the import figures, which rose above the level of July last year and widened the gap between exports and imports to £51·1 million, the greatest adverse balance since last September. The best that can be said about this is that we apparently received value for money: the increase was not due to inflated prices as has largely been the case during the last two or three years.

Marshall Aid

It is evident that the country's trade position is not yet healthy, as it must be unless we are to become bankrupt. Naturally the Government is reluctant to depress further the standard of living, but this must be faced unless our export trade is considerably increased within the next year or so. Aid from America may keep us going until that increase is achieved, but it is to be hoped that there will be no repetition of the history of the American loan which was also designed to put us on our feet—and failed to do so.

Under the Marshall Aid plan we shall get food, essential raw materials and machinery (as well as some commodities which are not essential to existence but make life a little brighter). Among the materials of interest to the electrical industry are copper, lead and aluminium, all of which are very acceptable and can be usefully employed. Some steel would have eased our position even more, but the United States is also able to use more steel than can be produced at present. Another item in the list is "electrical equipment" (about £4·4 million) but no details of its nature are yet available. It is possible that small generating sets are included in this.

Substantial Contribution

It is to be hoped that a fair share of such materials as are to be made available will go to the electrical manufacturing industry which has clearly shown its ability to make the best of them. Once again the March export figures demonstrate the growing contribution which the industry is making to export trade, a contribution which promises to overshadow those of all other sections, considered proportionately. March electrical exports totalled about £7¾ million and thus were the second highest so far. January's figure was over £8 million but there were two more working days in that month.

As a result of the progress made this year the value of electrical exports during the first quarter were greater than for the whole of 1938, a fact which apparently justifies the Government in raising the "targets" for the electrical industry to

partly counterbalance a lowering of aim in other sections. It is unfortunately true that what we are exporting is not altogether an "exportable surplus." Much of the equipment, or the material used in its manufacture, is sorely needed at home. The Government must carefully consider how much further the electrical manufacturing industry can be pressed for exports without irreparably damaging the country's economy which is so largely dependent upon electrical equipment.

Fuel and Power Co-ordination

THE vagueness of the term "national fuel and power policy," which was employed freely at the Institute of Fuel lunch last week, may actually conceal a merit. That is if it indicates a realization that the intricacies of the relationship can be dealt with only as a result of extensive experience and not by preconceived ideas of finding appropriate spheres for the component industries. The public's response to Mr. Hugh Gaitskell's categorical statement that consumers will be entirely free (when restrictions can be removed) to choose the type of fuel they prefer will certainly favour electrical development.

Types of Coal

THE need to consider fuel saving in its qualitative as well as quantitative aspects were also emphasized on the same occasion. The utmost use must be made of relative plentiful inferior coals in order to reduce the use of scarce coking coals. The practice of burning low grades for generating electricity could be appreciably extended if the prices charged encouraged developments in this direction—a point to be borne in mind by the committee now investigating coal-price structure.

Price "Freezing"

REFERENCE was made in our last issue to the Miscellaneous Goods (Maximum Prices) Amendment Order which supplants the previous measure for "freezing" prices. The principal change is in the method of calculating the selling price of goods which a manufacturer has not previously made. The original provision that this price should be based on the cost of material, plus a percentage, was obviously unjust and gave rise to protests from manufacturers. Now the basis is to be the cost of production with an addition of 5 per cent, or for a sole distributor his costs of sale plus 5 per cent. The margin allowed is small but the new system is certainly more satisfactory.

The Over Fifties

ONLY a few years ago a requirement that candidates aged fifty years and over for corporate membership of the Institution of Electrical Engineers should pass a written examination would have borne hardly on many to whom modern educational opportunities were not available at the outset of their careers. The withdrawal by the Institution, as the body responsible for professional qualifications, of what could have been only a temporary concession was to be expected sooner or later. However, it is still open to such candidates to submit theses based on long experience, while those possessing approved exempting qualifications are unaffected by the change.

High-Voltage Transmission

THE publication in the April *I.E.E. Journal* of Dr. Borgquist's Transmission Section lecture of last year enables his conclusions to be considered in the light of the 1948 lecture delivered by Dr. Wanger a fortnight ago. It should be studied also in conjunction with Mr. P. Ailleret's article in our issue of 9th January. The Swedish State Power Board had clear reasons for choosing a.c. at 380 kV at this stage. Technique exists and equipment can be made available for that voltage, since the transmission distance during the next fifteen years will not in many cases exceed 350 miles. After that time the possibilities of high-voltage d.c. will again be considered.

Human Electrical Transmission

THE Kelvin Lecture has provided many opportunities for showing how widespread are electrical manifestations in other fields than those to which attention is commonly given. "The Nervous System as an Electrical Instrument," the lecture by Dr. B. H. C. Matthews last week, revealed an apt analogy between physiological aspects of the human body and the functioning of an extremely efficient electrical transmission system. It was also apparent how much the development of the membrane hypothesis owes to gradual improvements in electrical instruments.

Synchronous Generators

Influence of Power-Factor Rating on Stability

By W. Szwander, Dipl. Ing. (Warsaw), M.I.E.E.

THE following investigation aims at showing how the power-factor rating of a synchronous generator affects its stability. Fig. 1 represents the basic diagram of a generator rated for 0·7 p.f. lagging at full load, with a 140 per cent value of the synchronous reactance. On this diagram OF represents in power scale the rated kVA (and also the rated stator current in a modified scale), OF′ the rated kW and OA the maximum possible leading kVAr, i.e., the distance of the theoretical stability limit AX from the point O. In a voltage scale, AO represents the terminal voltage (assumed constant throughout this investigation) and OF the voltage drop $I.X_d$, caused by the stator current in the synchronous reactance of the generator. From the above, with the known value of the current, the ohmic value of the synchronous reactance (X_d) and the percentage synchronous reactance (x_d) can be determined. In an excitation scale, AF represents the maximum rotor loading (at the rated load), whereas AO is the no-load excitation, which as well is a measure of the air-gap of the machine.

The stability of a synchronous machine is characterized best by the maximum leading reactive load that can be carried by the machine with a constant terminal voltage (i.e., by the distance OA in Fig. 1). Sometimes it is preferable to consider the stability margins, i.e., the amounts of active power by which the loads of the generator can be increased, without altering the field strength, before the loss of stability occurs. The stability margins will obviously characterize not the machine in general, but its behaviour in certain particular load conditions, and it is necessary, therefore, to compare stability margins of various machines referred to the same conditions. In Fig. 1, the distances XF″, YF″ and ZF″ are the stability margins for the machine running with its full rated kW load and with power factors 0·9 lagging, 1·0 and 0·9 leading respectively, and stability margins for the same loads will be compared in cases of modified machines. Stability margins vary in the same direction as the maximum leading kVAr load, but the degrees of these variations are different. The lowest leading power-factor at the rated kW load, which can be reached before the generator loses stability, can also be regarded as a measure of stability of the machine.

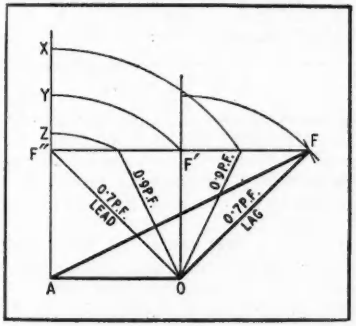


Fig. 1

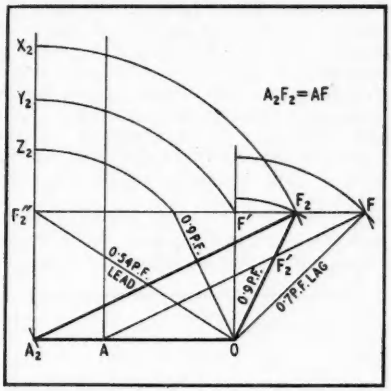


Fig. 2

In the present investigation the usual limitations are introduced, i.e., saturation and winding resistances are neglected, and only theoretical steady-state stability limits at constant terminal voltage are considered.

In Figs. 2 to 6 five different cases are illustrated of modifying the generator of Fig. 1, so as to increase its rated power factor from 0·7 lagging to 0·9 lagging. Values of powers, of stability margins, etc., derived from the diagrams are tabulated in table A, being expressed in this in relation to

the respective values of the initial machine.

The first three cases (Figs. 2, 3, 4) assume that the kW rating of the generator remains unchanged, which is the practical case when designing a generator for a given turbo-generator set. The first of the three cases (Fig. 2) assumes further the use of the same rotor for the machine with 0·9 lagging p.f., as was used for the initial machine with 0·7 lagging p.f. ($A_2F_2 = AF$). The result is the increased air-gap (OA_2 instead of OA) and the improved stability (OA_2, X_2F_2'', Y_2F_2'', Z_2F_2''). The stator winding is under-loaded (OF_2 instead of OF), which means either that less copper may be used in it (possible savings on iron due to reduced slot depth are insignificant) or that with the same windings the temperature rises will be lower. The case illustrated by Fig. 2 shows how without practically changing the cost of a generator its stability can be improved when rating it for a higher power factor at the same kW rating. Considering the voltage diagram in Fig. 2, i.e. the volts triangle A_2F_2O, it is necessary to reduce it in scale to the size of $AF_2'O$ on account of the terminal voltage remaining unchanged and equal to OA. Thus the voltage drop $I.X_d$, expressed in the same scale as in the diagram for the initial machine (Fig. 1), will be represented by the length OF_2'.

The next two cases (Figs. 3 and 4) illustrate how the generator designed for a higher power factor value can be made smaller and

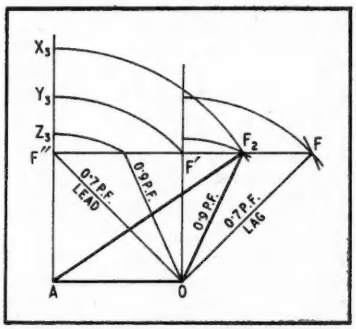


Fig. 3

cheaper, if no specific requirements are made in respect of its stability. In Fig. 3 the same air-gap has been assumed as in Fig. 1, with the result that the stability features of the machine remain unchanged. Its rotor loading (determining the frame size of the generator) decreases to 80 per cent of the initial value. The modification of design illustrated in Fig. 3 has a practical value only when a new machine with a smaller rotor diameter is to be built; if it is a matter of modifying an existing machine designed like that in Fig. 1, then obviously operating it according to Fig. 3 would mean an uneconomic incomplete utilization of the frame, and in such a case only a design modification according to Fig. 2 should be considered.

In Fig. 4 an even greater reduction of the generator frame size is illustrated, as is possible when with the increase of the rated power factor value the percentage synchronous reactance (or the short-circuit ratio) is left unchanged. This is the size of the generator which presumably would be supplied for the given power-factor rating if no specific requests were made in respect of stability.

The percentage synchronous reactance of

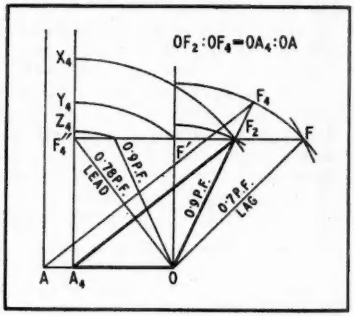


Fig. 4

the initial generator being expressed by the ratio OF : OA, the modified machine for 0·9 p.f. having the same value of percentage synchronous reactance must have its air-gap reduced to OA_4 so that $OF_2 : OA_4 = OF_4 : OA = OF : OA$.

Increasing the rated p.f. value of the machine with unchanged percentage synchronous reactance means also increasing the ratio of the stator loading to the rotor loading. The result is that in certain conditions the stator instead of the rotor may become the limiting factor of the design, and then the frame size of the generator cannot be reduced as much as would appear possible from the comparative rotor loading figures. The above may happen in the case of 3,000-r.p.m. generators, when increasing the p.f.

rating above 0·9, whereas with 1,500-r.p.m. machines the stator even earlier begins to play the decisive part.

The preceding shows that the value of the percentage synchronous reactance of a generator is not a correct measure of its stability, unless generators with equal rated power factors are being compared. Otherwise, of the two generators equivalent in stability, the generator designed for a higher power factor must have a lower value of

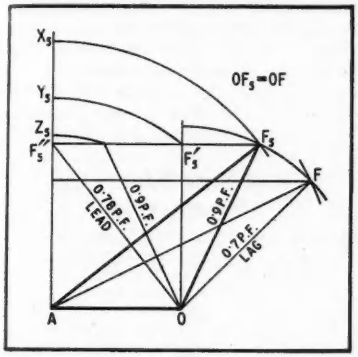


Fig. 5

percentage synchronous reactance. Two generators of equal kW rating but with different rated p.f. values will be equivalent in respect of stability when having equal air-gaps. For generators of various kW sizes

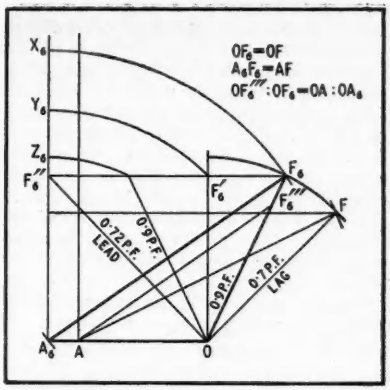


Fig. 6

and of various p.f. ratings the best measure for their equality in stability is when they have equal ratios of the maximum admissible leading kVAr to the rated kW figures.

The last two cases, shown in Figs. 5 and 6, are intended to illustrate what is the greatest use that can be made of an existing generator designed for 0·7 p.f. when changing its power factor rating to 0·9 without any modifications either of the stator or of the rotor. In Fig. 5 an unchanged air-gap is assumed. The result is that with full utilization of the stator, the kW-rating could be accordingly increased, but the rotor is not fully utilized. The maximum possible leading kVAr load remains

TABLE A—Characteristics of Modified Genrator Expressed as Percentages of those of Original Machine

	Original Generator	Modifications of Original Generator to 0·9 lagging rated Power Factor				
		With unchanged kW rating			With full utilization of the frame	
	Designed for 0·7 lagging power factor (with 140 per cent synchronous reactance value)	With same rotor (same frame size)	With same air-gap	With same per centage value of synchronous reactance	With same air-gap	With air-gap modified for full utilization of both rotor and stator
Case illustrated in Fig.	1	2	3	4	5	6
kW	OF′ =100	OF′ =100	OF′ =100	OF′ =100	OF_5' =129	OF_6' =129
kVA, amps (stator)	OF =100	OF_2 =77·8	OF_2 =77·8	OF_2 =77·8	OF_5 =100	OF_6 =100
Max. lead. kVAr $\left(\frac{Et^2}{Xd}\right)$	OA =100	OA_2 =154	OA =100	OA_4 =77·8	OA =100	OA_6 =122
Stability from full kW load, and						
0·9 lag. P.F.	XF″ =100	X_2F_2'' =163	X_2F'' =100	X_4F_4'' = 77	X_5F_5'' =100	X_6F_6'' =123
1·0 P.F.	YF″ =100	Y_2F_2'' =202	Y_2F'' =100	Y_4F_4'' = 66	Y_5F_5'' = 81	Y_6F_6'' =119
0·9 lead. P.F.	ZF″ =100	Z_2F_2'' =362	Z_2F'' =100	Z_4F_4'' = 38	Z_5F_5'' = 46	Z_6F_6'' =108
Minimum admissible leading p.f. at full kW	0·7	0·54	0·7	0·78	0·78	0·72
Terminal volts (E_t)	OA =100	OA =100	OA =100	OA =100	OA =100	OA =100
I·Xd	OF =100	OF_2' =50·5	OF_2 =77·8	OF_4 =100	OF_5 =100	OF_6'' = 82
Xd (in ohms, equals IXd : I)	100	65	100	129	100	82
xd (per cent, equals IXd)	100	50·5	77·8	100	100	82
i_m (rotor amperes)	AF =100	A_2F_2 =100	AF_2 = 80	A_4F_2 = 70	AF_5 = 91	A_6F_6 =100
Air gap	OA =100	OA_2 =154	OA =100	OA_4 =77·8	OA =100	OA_6 =122

unchanged, whereas the stability margins become smaller because they are now referred to an increased kW rating (the ratio of the maximum leading kVAr's to the rated kW's is reduced, therefore the stability is inferior).

Fig. 6 illustrates how both the stator and the rotor may be fully utilized, if the increase of the rated p.f. is accompanied by a suitable increase of the air-gap. This case is more advantageous than that of Fig. 5, because with the full utilization of the rotor the stability of the generator may be also improved to the extent of the increase of the air-gap.

The conclusions which can be derived from the present investigation are as follows.

1. When increasing the rated p.f. value of a generator, without changing its kW rating:—

(*a*) If the machine frame is left unchanged (i.e., the same rotor is used), the air-gap can be increased with resultant improvement of stability (which is most pronounced in respect of stability margins at leading power-factor loads).

(*b*) If the air-gap of the machine is left unchanged, the stability remains unaltered; the generator can be built on a smaller frame (with a smaller rotor).

(*c*) If the percentage synchronous reactance is kept unchanged, both the frame and the air-gap of the generator are reduced and the stability of the machine deteriorates.

2. When increasing the rated p.f. value of a generator and making full use of the possible increase of its kW rating:—

(*a*) If the air-gap of the machine remains unchanged, the rotor cannot be fully utilized; the stability margins are reduced, on account of the increased kW rating, to which they are now referred, and the maximum possible leading kVAr load remains unchanged.

(*b*) If the air-gap is increased, so as to make possible the full utilization of both stator and rotor, the stability of the generator is improved; this is the case of the best utilization of the given machine-frame.

A further conclusion can be drawn from the diagrams, namely, that when designing a new generator, its power-factor rating and its stability properties (determined by the air-gap size) do not depend on each other. As it has been already stressed by the author elsewhere (W. Szwander—"Fundamental Electrical Characteristics of Synchronous Turbo-Generators." *J.I.E.E.*, 1944, Part II, June, pp. 185-194), the rated power-factor of a generator should be selected to suit the average anticipated conditions of inductive loads of the machine, whereas the size of the machine air-gap ought to be fixed so as to ensure satisfactory stability margins (or satisfactory leading kVAr load-carrying capacity) at the lowest anticipated leading power-factors. Thus the sizes and the relative positions of the sectors OF and OA (Fig. 1) should be determined independently (their ratio giving the percentage value of the synchronous reactance), and the resultant length AF will then give the required rotor-loading and the machine frame-size.

The numerical values referred to in the present investigation are examples only, being based on deliberately made assumptions; qualitatively, however, the conclusions reached are of universal character.

Canadian Electrical Production

MUCH interesting detail regarding the production of electrical machinery and apparatus in Canada has been issued in relation to 1945. The total value then was $230,532,000, compared with $283,071,000 in 1944, a decline of 18½ per cent. (Preliminary total for 1946 is $243,444,000.) In 1945 the number of firms so engaged was 247, thirteen more than in the previous year. The totals do not cover porcelain insulators, electric washing machines and some minor electrical products, the total value of which amounted to about $15,000,000 in 1945, much the same as in 1944. The principal items are shown in the accompanying table, with the 1944 figures added for comparison. The decline in the radio industry was due to a cut by about one-third in the manufacture of war equipment; the production of civilian sets rose to $979,000.

	1944 $ (000)	1945 $ (000)
Batteries, storage	9,024	10,104
Batteries, dry cell	5,296	5,861
Vacuum cleaners	264	910
Generators, A.C.	2,862	2,812
Generators, D.C.	3,049	1,030
Lamps, standard size	4,922	5,629
Lamps, miniature	1,049	1,151
Washing machines	1,679	3,537
Furnaces	386	303
Watt-hour meters	1,338	2,301
Wires and cables	31,097	33,609
Motors	15,520	14,710
Radio apparatus and parts other than valves and transformers	100,099	39,686
Radio valves	3,746	3,280
Refrigerators	967	1,226
Transformers and parts	7,292	10,337
Telephone material	9,525	6,169
Stoves	273	1,059
Switchgear (except telephone)	6,877	8,707
Wiring devices	4,513	5,240
Welding apparatus	1,215	1,549
Apparatus and parts, n.e.s.	42,907	37,041

Views on the News

Reflections on Current Topics

MUCH ado was made about the Electric Lamp Manufacturers' Association during the second-reading debate on the Monopoly Bill in the House of Commons. I do not propose to adjudicate upon the merits or shortcomings of E.L.M.A. for no doubt something may be said on both sides—as usual. Some of the Parliamentary critics admitted that their remarks were based upon untested evidence, which was rather rash of them, and there were certainly some wild statements. Both Mr. Oliver Lyttelton in the House and Mr. W. J. Jones, director of E.L.M.A. in a press statement were able to demolish quite easily the arguments that the output of lamps was restricted by the Association and that entry to the industry was barred by that body. The counters of the chain stores hold sufficient evidence of the absurdity of these allegations. And there is plenty of other disproof.

* * *

That indefatigable correspondent Mr. Alex. Milne (Glasgow) complains that many manufacturers are still fitting domestic appliances with twin flex—often terminating in a lampholder adaptor. In spite of arguments that the apparatus can often be safely used without being earthed, he says, it would be a very strange building indeed in which it was not possible to come into contact with an earthed conductor of some kind " and to quote Shakespeare (I think) 'therein lies the rub.'" What Shakespeare (or Hamlet) said was " Ay ! there's the rub " (and went on) " For in that sleep of death what dreams may come ? " Earlier, the Prince refers to the " thousand natural shocks that flesh is heir to." All too appropriate.

* * *

In a letter to members of the Electrical Contractors' Association, Mr. L. C. Penwill (director) draws attention to recent legal proceedings in which a householder recovered damages from a painter and decorator for loss of property. The painter was left in charge of the house while his customer was absent. Later, he went to a neighbouring shop and while he was away somebody entered the house by the front door, which was insecurely fastened, and stole property valued at over £300. When the customer refused to pay his bill the painter sued him whereupon the customer counterclaimed for the loss of his property and a county court judge gave judgment in the customer's favour and this was subsequently confirmed by the Court of Appeal. The Courts held that the painter was under an obligation to take care of the premises and had failed in his duty by not seeing that the front door was securely fastened. The case is quoted as an example of significance to electrical contractors who may easily find themselves involved in similar circumstances.

* * *

There must be many men who are influenced to embark on matrimony by the thought of improved laundry facilities, but I have not before now come across a case of women wanting to get married for the same reason. I am glad to say, however, that this does not mean that the equality of the sexes has now come to the stage at which prospective husbands are expected to do the family's washing, but that a bachelor winner of a Bendix washing machine in a sales contest in America has received thirty-seven offers of marriage, all of which he has turned down.

* * *

Macaulay, you will remember, reflecting upon the Puritans' attitude towards bear-baiting, was of the opinion that their disapproval was due not so much to the pain it gave to the bear as to the pleasure it gave to the spectators. I detect a kindred feeling among some of those who urge the need for more and more cuts in power consumption. They seem to be thinking less of the pleasure given to power station operators than of the pain inflicted on the consumer.

* * *

Reno, Nevada, the notorious home of easy divorce has, according to the *Electrical World*, reduced its bright lights to gasoline lanterns. The reason is the enforcement of power-saving regulations by the Nevada Public Service Commission. Domestic, agricultural and commercial consumption has had to be cut by 20 per cent, but I cannot believe that it is literally true that the orders " call for a reduction of all outdoor lighting to one 75-W bulb."—**REFLECTOR.**

Inventions Bill

Delaying Publication of Information

THE Development of Inventions Bill, to which reference was made in last week's issue of the *Electrical Review*, proposes the formation of a National Research Development Corporation, constituted under the Board of Trade, the purpose of which will be to develop and exploit British inventions resulting from public research.

It has been a matter of comment for a long time that there has been lack of uniformity in the procedure adopted by various Government research departments in dealing with new inventions or processes and it must be agreed that any steps which can be taken to ensure that British invention gets proper protection, and the work of individual inventors is recognized, is highly desirable. There would seem, however, to be pitfalls in the way of carrying out the work which it is proposed to assign to the new Corporation.

By "Researcher"

To assess the commercial value of an invention and decide whether it should be patented and developed necessitates a full and confidential examination of the idea by those who will be responsible for making the decision. For the new Corporation to carry out its duties, it will be necessary for every new development, invention, or process emanating from a Government research department to filter through the meshes of the Corporation before the decision is made whether to let it see the light of day through the medium of a patent specification, a paper to be read before a professional institution, or publication in the technical press. Other inventions will, no doubt, be held up to be reviewed from time to time in the light of developments. There will also be some inventions which it will be considered desirable to treat as secret.

It will be remembered that after the war quite unpardonable delays occurred in giving publication to British inventions and discoveries of the war years. American journals and scientific societies had published widely most of the material which long afterwards was released from British sources to find its way into various British publications. If it has been hard enough in the past to extract information promptly from Government departments for publication before professional institutions, or in the technical press, the constitution of this new authority to be set up as a clearing house can only result in a still further delay in publication of British scientific work. This is a matter not only of concern to technical journals, but to professional institutions in every branch of science.

In the national interest prompt publication to indicate British achievements must often be of far greater moment than any possible commercial return which might be obtained by patent protection. If the Government's intention is to curtail, as far as possible, the publication of British scientific achievement, then the proposed new Corporation undoubtedly provides all the machinery needed.

Stretford Undertaking

Trafford Power Station Reconstructed

THE completion of the reconstruction of the Trafford power station (Manchester) of the Stretford and District Electricity Board has provided an opportunity for Mr. H. G. Bell, chief engineer and manager, to issue a well-illustrated brochure summarising the history of the Board and its predecessors whose area of supply comprises Stretford, Trafford Park, Urmston and Irlam. All the coal consumed is canal-borne from local pits and is unloaded from barges by Henry Simon suction plant. The Babcock & Wilcox boiler auxiliaries are controlled on the Metropolitan-Vickers "unified" system, of the Ward-Leonard type, motor-generators being used for two of the boilers and mercury-arc rectifiers (the first example of the kind in this country) for the two later boilers.

The first turbo-alternator (December, 1941) is a 30,000-kW, 13,000 r.p.m. Parsons set generating at 33 kV. The second set (December, 1947) of the same size and speed is of M-V make. The restricted station site will not accommodate any more steam generating plant. Work is, however, proceeding in readiness for the installation of a 15-MW gas-turbine set, on an old boiler house site; this is expected to be commissioned in 1950. The layout will provide for 60 MW of gas-turbine plant, making the ultimate station capacity 120 MW.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

The Möhne Dam

WHILE I was interested, in view of my late connection with the Public Utilities Branch of the Control Commission, Germany, to read your report (page 553, 9th April) that the Möhne Dam is to be rebuilt, there seems to be some mistake in the report.

The Dam itself was repaired by the end of the war, but no attempt has as yet been made to rebuild the two power stations which were situated at the foot of the dam, and were totally destroyed by the R.A.F. I presume it is to the stations that reference should have been made by *Reuter*.

Hebburn-on-Tyne. F. N. PRANGNELL,
Late Assistant Director, P.U. Branch, C.C.G.

Harris Tweed Trade Mark

IN your issue of 16th April "Reflector" alludes to a recent statement about Harris tweed by Mr. A. E. MacColl, deputy chairman of the North of Scotland Hydro-Electric Board, in which he criticized the application of the well-known Harris tweed trade mark and urged the use of machinery for increasing production. While such a policy might produce a short-term advantage, in the long run it could produce only disaster.

The reputation of Harris tweed has always rested on the fact that it is the product of individual craftsmen and if its production were to become mechanized, then the whole basis of its prestige would vanish. Such a change could not possibly react to the ultimate advantage of the islanders of the Outer Hebrides. Furthermore, it would be especially deplorable at the present time when Harris tweed is playing an important part in Britain's export drive.

London, E.C.2. GEORGE ELLIS,
Chairman,
Harris Tweed Association, Ltd.

Contractors and the B.E.A.

ON page 597 of the issue of the *Electrical Review* of 16th April, you refer to a speech I made at the annual dinner of the South Staffs Branch of my Association, held at Wolverhampton.

In your reference to my statement regarding the number of qualified electrical contractors who are not members of my Association and to the number of electrical contractors to whom the Ministry of Works has issued Certificates of Registration under Defence Regulation 56AB, you quote the figures of "5,000 or 6,000" and "100,000" respectively, and the purpose of this letter is to state that these figures are inaccurate to the extent that the Ministry of Works has issued some 10,000 licences to electrical contractors, and that I estimate that the number of qualified electrical contractors outside the membership of the E.C.A. does not exceed 500 or 600. You will agree that it is essential that the correct figures should be made available.

London, W.C.2. L. C. PENWILL,
Director and Secretary,
Electrical Contractors' Association.

Adult Apprenticeship

CAN a man of thirty-five serve an apprenticeship? The question arises again due to changing requirements. Surely those who have the courage and enterprise should be encouraged. W. J. M.

Domestic Water Heating

A DRAFT Code of Practice, prepared by a Committee convened by the Institution of Electrical Engineers on behalf of the Code of Practice Committee, deals with the provision in domestic premises of electric water heating installations having a nominal storage capacity not exceeding 100 gal.

Principles governing installation, layout and the minimizing of corrosion are set out. Four types of storage heaters and certain types of immersion heaters are described, with notes on their suitability for varied requirements and their location. Advice is included on the selection of metals for storage vessels, pipe dimensions, pipe connections for hot water radiators and towel rails when solid fuel is used in conjunction with electricity, and the use of indirect cylinders and the provision of draining facilities.

The draft also deals with the installation of immersion heaters and thermostats in storage tanks and cylinders, and has appendices giving technical data on thermal efficiency and heat losses. Comments should be submitted by 26th May, 1948. Copies of the draft (proof reference CP (B) 725) are obtainable from the British Standards Institution at 2s. 6d. net.

Institute of Fuel

Celebration of Twenty-One Years

MORE than 700 members and guests of the Institute of Fuel attended the luncheon presided over by Dr. C. H. Lander (president) on 22nd April which commemorated the Institute's twenty-first year. MR. HUGH GAITSKELL, Minister of Fuel and Power, in proposing the toast of "The Institute," referred to the improved coal output which permitted substantial exports. The utmost fuel economy was, however, still necessary, especially in certain types of good quality coal, though there might be an excess of inferior grades for several years ahead owing to mechanized mining and to deficiency in washing and cleaning capacity.

The present oil shortage was caused by an increase in consumption in the United States from 306 gal. per head in 1938 to 506 gal. in 1947; in the latter year 81 gal. per head was used in Britain. Oil was now being imported into the United States, which was also undertaking research into synthetic production from coal and natural gas. The rate of expansion of British oil production depended upon the steel available, and the world shortage was likely to continue for a long time.

Co-ordination of fuel and power had been undertaken with a view to satisfying the needs of consumers at minimum cost, which also implied efficient use in the home and in industry. The serious expense to the community of smoke pollution was often ignored in comparing fuel costs, but he hoped that in due course smoke would be removed from cities. A full information service for consumers must be created so that they could choose the most appropriate type of fuel or appliance. The policy of fuel services must ensure that prices were related to costs.

In responding, DR. LANDER expressed the main objects of a national fuel policy as efficiency in production and use and conservation of the more valuable kinds of fuel. In the past the attention paid to these aspects had come in waves; there had been more waste in periods of prosperity, and the lessons learned in slumps were forgotten.

DR. D. T. A. TOWNEND (director general, British Coal Users' Research Association) proposed the health of "The Ministers," to which LORD HALL (First Lord of the Admiralty) replied. He welcomed the blending of the heat and power industries, which he regarded as necessary for industrial well-being.

In proposing "Our Guests," MR. J. R. RYLANDS (E. Green & Co.) remarked that there was little in the way of fuel that could not be turned into power by the electrical industry. He paid tribute to the technical Press for its helpful and well informed support of efforts to achieve high standards of efficiency. LORD CITRINE (chairman, B.E.A.), who responded, supported the move towards co-ordination of the fuel industries. He had faith that inventiveness and organizing capacity would keep Britain a first-class power.

Brazilian Railway Electrification

British Companies' Contracts

IN September, 1946, the English Electric Co. was awarded the contract for the electrification of a part of the main line of the Sao Paulo (Brazilian) Railway Co. Electric traction is already in operation on the Paulista railway as far as Jundiai, where it joins the Sao Paulo railway (known since nationalization as the Estrade de Ferro Santos a Jundiai) and the new scheme covers the 67-km section between Jundiai and Moocha. Further extension to Alto da Sierra and later to the port of Santos is contemplated.

The English Electric Co. is supplying fifteen 3,000-h.p. locomotives operating at 3,000V d.c., these being the largest single-unit electric locomotives to be made up to the present in Great Britain. The contract also covers three 3-coach multiple-unit trains. The company is also supplying three mercury arc rectifier substations with supervisory control equipment, and in addition, 33-kV switching and transforming apparatus is being provided for controlling the main supply to the substations.

The supply and installation of overhead track equipment is being undertaken by British Insulated Callender's Cables, Ltd. This consists of steel structures, catenary wires, contact wires, transmission lines, signal lines and supervisory control lines. Catenary construction is employed, as train speeds will reach 100 km per hour. In addition to the contact wires, the overhead equipment will carry the necessary signal lines, duplicate 33-kV power circuits to feed substations along the route, and a catenary-suspended supervisory control-cable for the remote control of substations and track selection cabins. The total length of all track to be equipped is 190 km. About three-quarters of the steel structures will be of the broad flange beam type. These are being rolled and fabricated in the Cargo Fleet Iron Co.'s works at Middlesbrough. The balance will be of the lattice bridge type, and are to be supplied by Painter Bros., Ltd., of Hereford.

Monopoly Bill

Attack on E.L.M.A.

IN moving the second reading of the Monopoly Bill (*Electrical Review*, 9th April, p. 546) on 22nd April, the President of the Board of Trade (Mr. Harold Wilson) said that the measure was designed to prevent restrictive practices which might increase export costs, prevent the fullest development of inventions and new techniques, reduce output or maintain prices at an excessive level to home consumers.

Mr. Wilson agreed that a monopoly was neither good nor bad in itself, and one which involved the full integration of the financial and economic structure of an industry, such as Imperial Chemical Industries, might well have great technical advantages within itself which a cartel or price-fixing association had not. At the same time its strong selling power gave it power to do harm to the public or to particular consumers. Patent monopolies would come within the scope of inquiries by the proposed Monopoly Commission, but action to correct such matters should be taken under the Patents Act, not this measure.

Lamp Prices and Pooling of Patents

After quoting instances of previous inquiries into allegations of monopoly Mr. Wilson referred to the electric lamp industry and said that it was widely understood that lamps cost more here than in any other big producing country; the lamp manufacturers were linked in a tight ring based on the pooling of patents.

Mr. Oliver Lyttelton intervened to ask if the Minister was not aware that the price here was lower than in any other European country. Mr. Wilson said that if his statement was wrong Mr. Lyttelton would no doubt produce evidence during the debate. He went on to say that recently an ex-R.A.F. pilot wanted to develop a new technique for making fluorescent lamps but was "frozen out" by the withholding of supplies of glass tubing from factories controlled by ring firms. He had not been able to test the accuracy of the evidence.

Mr. Lyttelton and Earl Winterton objected to statements based on unsupported evidence.

Proceeding Mr. Wilson said that care would be taken that only substantial cases would be referred to the Commission by the Board of Trade. He maintained that there was no case for including national boards within the scope of the Bill as they operated under conditions laid down by Parliament to protect the public.

Sir David Maxwell Fyfe contended that the Bill could not be effective if it was confined to one side of industry and that the restrictive practices of labour should be brought into the light of day and he was not satisfied with the protection afforded to the public in the case of nationalized industries. He made a number of suggestions regarding directions to the Commission which, he considered, would help the Commission and the public.

Mr. E. Fletcher followed with a criticism of the Electric Lamp Manufacturers' Association which, he stated, maintained prices and fixed quotas for members' production of lamps. This inflated prices to the consumer and restricted production and would-be entrants to the industry to produce for export. The Association prevented competition by the pooling of patents, the control of materials and of the channels of distribution.

Later in the debate Mr. Oliver Lyttelton said that he welcomed the Bill which, he thought, would set at rest the rumours which used to exist about the suppression of patents. He went on to quote the prices of the 60-W lamp in European countries to show that (excluding purchase tax) the lowest price prevailed in this country. The price was higher than it was in the United States but there were good reasons for that. There was no restriction on output, on entry to the industry or on retailers. Exports had been mentioned: last year (including lamps made in Dominion factories) 54 million lamps were exported. Of our own production of about 120 million, 35 million were exported.

Cheaper than Pre-War

He could think of very few manufactured articles which, considering the rise in wages and the cost of all raw materials, were now selling at 28 per cent below the pre-war price. He maintained that that fall was due to the greatly increased technical efficiency.

He gave general support to the Bill although he thought that it could be improved. He did not think that restrictive trade union practices could appropriately be dealt with in the Bill, but he would have expected a statement from the Government that it was going to sweep away such restrictive practices. He also saw no reasons why State monopolies should not be subject to the same laws of inquiry.

Mr. Herbert Morrison, Lord President of the Council, who followed, also touched upon lamp prices and the exchange of patents. Mr. Lyttelton pointed out that, in spite of patents, there were fourteen companies in this country, who were not members of the Association in full production of lamps.

Mr. Morrison went on to say that the question of including nationalized industries within the scope of the Bill had been favourably considered but it was thought that Parliamentary control was sufficient to protect the public.

The Bill was read a second time without a division and committed to a Standing Committee.

Next Week's Events

Monday, 3rd May

BIRMINGHAM.—James Watt Institute, Great Charles Street, 6 p.m. I.E.E. South Midland Centre. Kelvin Lecture. "The Nervous System as an Electrical Instrument," by Dr. B. H. C. Matthews.

LONDON.—At the Institution of Electrical Engineers, Savoy Place, W.C.2, 5 p.m. Institution of Post Office Electrical Engineers. "The Cross Bar Switch and its use in the Swedish Telephone System," by J. A. Lawrence.

Tuesday, 4th May

LEEDS.—Electricity Offices, Whitehall Road, 6 p.m. I.E.E. North Midland Centre. Annual general meeting.

LONDON.—Savoy Place, W.C.2, 7 p.m. I.E.E. London Students' Section. "Heavy-Duty Cartridge Fuses," by K. C. Pounds.

Oddfellows Hall, 186, Hammersmith Road, S.W., 7 p.m. Association of Supervising Electrical Engineers (West London Branch). "The Strange History of Hire Purchase," by E. P. Hollis.

MANCHESTER. — Engineers' Club, Albert Square, 6 p.m. I.E.E. North-Western Centre. Annual general meeting. "Load Dispatching and the Reasons for it, with special reference to the British Grid System," by A. R. Cooper.

Wednesday, 5th May

LONDON.—At the Royal Institution of Chartered Surveyors, 12, Great George Street, S.W.1, 9.45 a.m. Iron and Steel Institute. Annual general meeting. (Continued on Thursday.)

PORTSMOUTH. — Council Chamber, 6.30 p.m. I.E.E. Southern Centre. "Rural Electrification: the Use of the Single-Phase System of Supply," by J. S. Pickles and W. H. Wills.

Thursday, 6th May

TREFOREST.—School of Mines, 3.15 p.m. Illuminating Engineering Society (Cardiff Centre). Discussion on "Mining Lighting," followed by annual general meeting.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Installations Section. Short papers by younger members.

Friday, 7th May

BARNSLEY.—Mining and Technical College, 3 p.m. Association of Mining Electrical and Mechanical Engineers (Yorkshire North-West Branch). "The Non-Metallic-Screened Cable," by J. T. Frost.

BATH.—Pump Rooms, 7 p.m. I.E.E. Bristol Students' Section. Annual general meeting, followed by paper on "The Principles of the Metadyne," by E. J. Davies and R. A. Willford.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurements Section. Discussion on "The Application of Instruments to Power Station Operation."

Saturday, 8th May

LEEDS.—City Electricity Department, Whitehall Road, 2.30 p.m. I.E.E. North Midland Students' Section. Annual general meeting and films afternoon.

LONDON.—I.E.E. London Students' Section. Visit to Abinger Magnetic Station, near Dorking.

MANCHESTER.—Engineers' Club, Albert Square, 2.30 p.m. I.E.E. North-Western Students' Section. Annual general meeting.

Parliamentary News

By Our Special Reporter

IN the House of Commons last week Mr. Gammans asked the Minister of Fuel and Power how many chief engineers and senior technical officers previously employed by electricity distribution companies and local authorities would not be taken over by the British Electricity Authority, and what terms of compensation for loss of office they might expect to receive; on what date he proposed to issue regulations on compensation under Section 55 of the Electricity Act, 1947; and what had caused the delay.

Mr. Robens (Parliamentary Secretary, Ministry of Fuel and Power), said it was not yet possible to say how many of these officers might eventually be redundant, but he was advised that the number was likely to be small. He was unable at present to say when the regulations would be laid. They must first be discussed in draft with representatives of the associations and unions catering for employees in the industry.

Mr. Gammans asked if the Parliamentary Secretary could assure the House that none of these officers had been dispensed with without being paid any compensation. Could he give some better indication about when these regulations would come out, as they would affect the livelihood of a large number of people?

Mr. Robens said he thought it was reasonable to give an opportunity to the Employees' National Committee, which represented all the interests, to discuss the draft regulations, so that no eventuality such as Mr. Gammans had suggested might occur.

Non-Ferrous Metal Prices

In reply to a question by Mr. Erroll, Mr. George Strauss said that tin was bought at a price fixed after discussion with representatives of the producers, who all got the same basic price. Copper, lead, zinc and chrome ore were bought under varying arrangements from a large number of industrial producing companies. Aluminium was bought under contract from producers in this country, and Canada. All these prices must be treated as confidential in the interests of both the producer and the Ministry.

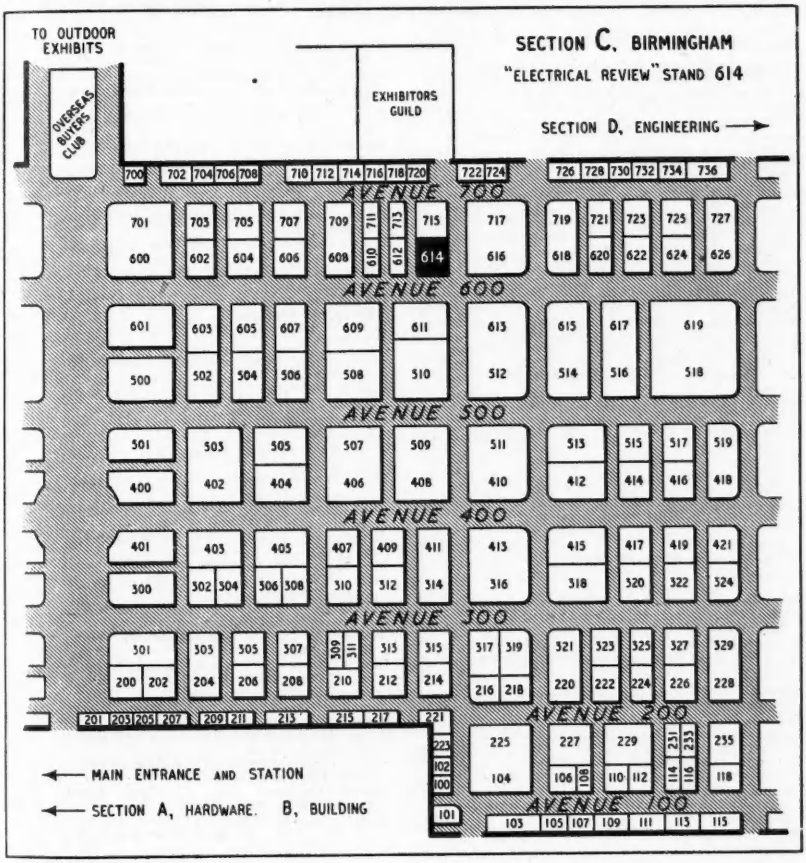
British Industries Fair

Increased Number of Electrical Exhibits

WITH every successive British Industries Fair the proportion of electrical exhibits tends to grow. Not only does the Electrical Section itself expand but the number of stands in the other sections containing items of electrical interest increases from year to year: in fact, at Birmingham it is difficult now to find a stand which has not some bearing on the electrical industry.

When the Fair opens on Monday about 400 of the 1,100 exhibitors at Birmingham and rather more than a hundred of the 2,350 displays at Olympia and Earls Court, London, will include items of definite electrical interest. In the following pages we give brief details of each of these displays drawing attention to any items of particular interest.

Most of the electrical exhibits at Birmingham are, of course, to be found in the Electrical Section (C) and to assist visitors to find their way round a plan is given below. Although those with only limited time at their disposal would do well to concentrate on this section, several of the most interesting exhibits are to be found



elsewhere in the Hardware (A), Building (B) and Engineering (D) sections. Once again there is no separate Gas Section, the comparatively few gas exhibits occupying stands at one end of the Electrical Section.

The *Electrical Review's* stand C 614 (telephone: FAIR 533) is in approximately the same position as last year. Visitors will be very welcome and our representatives will be pleased to assist them in any way possible—directing them to particular exhibits and advising them on all technical and commercial matters relating to the electrical industry.

Visitors to the London Section will find a good deal to interest them at both Olympia and Earls Court. At Olympia there is a comprehensive display of electrical instruments, clocks and lighting fittings, while vacuum cleaners and plastics make Earls Court well worth a visit.

Until Friday week (14th May) the Fair opens each weekday at 10 a.m. at Birmingham and 9.30 a.m. in London, all three sections closing at 6 p.m. The general public is admitted every day at Birmingham, but at Olympia and Earls Court only on the 5th, 8th and 12th May.

List of Electrical Exhibitors

BIRMINGHAM

Exhibitor	Stand
Accles & Pollock, Ltd., Paddock Works, Oldbury, Birmingham	D 619 & 518
A.C.E. Machinery, Ltd., Porden Road, S.W.2	D 235
Ackworthie, John, Ltd., Maypole Lane, Birmingham, 14	D 752
Acru Electric Tool Manufacturing Co., Ltd., 123, Hyde Road, Manchester, 12	C 209
Aeraspray Manufacturing Co., Ltd., 179-213, Thimble Mill Lane, Birmingham, 7	D 734
Aerlec Aluminium, Ltd., 12, Greek Street, London, W.1	A 524
Aerograph Co., Ltd., Lower Sydenham, S.E.26	D 302
Aerox Productions, Ltd., Central House, Upper Woburn Place, London, W.C.1	D 429
Aidas Electric, Ltd., Sadia Works, Rowdell Road, Northolt, Middlesex	C 103
Air Ducts, Ltd., Great West Road, Brentford	B 300
Airscrew Co., Ltd., Weybridge, Surrey	D 726
Aiton & Co., Ltd., Stores Road, Derby	D 608
Aladdin Industries, Ltd., Greenford, Middlesex	A 428
Allday, Wm., & Co., Ltd., Alcosa Works, Stourport-on-Severn	D 505
Allen, Edgar, & Co., Ltd., Imperial Steel Works, Sheffield, 9	D 630
Alumilite & Alzak, Ltd., and associated companies: British Anodising, Ltd., and Aluminium Protection Co., Ltd., 40, Brook Street, London, W.1	A 629
Aluminium Development Association, 33, Grosvenor Street, London, W.1	C 116
Aluminium Industries, Ltd., Lion Works, Engine Lane, Lye, Stourbridge	A 506
Amplifiers, Ltd., Billet Road, London, E.17	C 114
Anchor Cable Co., Ltd., 52-54, High Holborn, London, W.C.1	C 413 & 316
Ashdowns, Ltd., Eccleston Works, St. Helens	C 105
Associated Iliffe Press, Dorset House, Stamford Street, London, S.E.1	D 214
Austinlite, Ltd., Lighthouse Works, Smethwick	D 604
Auto-Lec Engineering Co., Chandos Pole Street, Ashbourne Road, Derby	A 327 & 226
Autometric Pumps, Ltd., Waterside, Maidstone	D 503
Avery, W. & T., Ltd., Soho Foundry, Birmingham, 40	D 523 & 420
Babcock & Wilcox, Ltd., Farringdon Street, London, E.C.4	D 407 & 306
Bakelite, Ltd., 18, Grosvenor Gardens, S.W.1	C 404
Bank Hardware Manufacturing Co., Ltd., Whittimere Street, Walsall	A 325
Barford (Agricultural), Ltd., Grantham	A 307
Barlow-Whitney, Ltd., Coombe Road, London, N.W.10	C 115
Barries Electrical Agencies, Ltd., King Street, Brighton, 1	C 302
Barwell, James, Ltd., 40, Great Hampton Street, Birmingham, 18	B 521
B.B. Chemical Co., Ltd., Ulvercroft Road, Leicester	D 115
Belling & Co., Ltd., Bridge Works, Enfield	C 515
Belling & Lee, Ltd., Cambridge Arterial Road, Enfield	C 710
Bendix Home Appliances, Ltd., 99a, Park Lane, London, W.1	D 303 & 202
Benham & Sons, Ltd., 66, Wigmore Street, London, W.1	B 320
Beresford, James, & Son, Ltd., Kitts Green Works, Mackadown Lane, Marston Green, Birmingham, 7	C 214
Berger, Lewis, & Sons, Ltd., 35, Berkeley Square, London, W.1	B 619 & 518
Berry's Electric, Ltd., 86, Newman Street, London, W.1	C 229
Biddle, F. H., Ltd., 52, Clerkenwell Close, London, E.C.1	B 324
B.I.F. Engineering Co. (1940), Ltd., 212, Aston Road, Birmingham, 6	A 622
Birkby's, Ltd., Woodfield Mills, Liversedge, Yorks	C 307
Birlec, Ltd., Tyburn Road, Erdington, Birmingham, 24	D 509 & 406
Birmid Industries, Ltd., Dartmouth Road, Smethwick	D 725
Birmingham Battery & Metal Co., Ltd., Selly Oak, Birmingham	D 514
Birmingham Electric Supply, 14, Dale End, Birmingham, 4	C 509 & 408
Bitulac, Ltd., Collinwood Buildings, Newcastle-upon-Tyne, 1	B 702
Black & Decker, Ltd., Harmondsworth, Middlesex	C 607
Blending Machine Co., Ltd., 3, Bond Street, Birmingham, 19	C 605
Bliss, E. W., (England), Ltd., City Road, Derby	D 603
Bolton, Thomas, & Sons, Ltd., Mersey Copper Works, Widnes, Lancs.	D 123
Bowthorpe Electric Co., Ltd., Goodtric Works, 6, Brewer Street, Oxford	C 217
Bradley & Turton, Ltd., Caldwall Works, Kidderminster	D 239
Bratt Colbran, Ltd., Lancelot Road, Wembley	C 504
Bray, George, & Co., Ltd., Leicester Place, Blackman Lane, Leeds, 2	C 412
Brentford Transformers, Ltd., Breco Works, Kidbrooke Park Road, London, S.E.3	D 226
British Aluminium Co., Ltd., Salisbury House, London, E.C.2	D 605
British Electrical Development Association, 2, Savoy Hill, London, W.C.2	C 509 & 408
British Emulsifiers, Ltd., 12, Greek Street, London, W.1	A 524
British Insulated Callender's Cables, Ltd., Norfolk House, Norfolk Street, London, W.C.2	C 413, 316 & 318

British Jeffrey-Diamond, Ltd., Stennard Works, Wakefield .. .. D 526
British Made Electrics, Ltd., Hotric Works, Broxburn, West Lothian .. .. .. C 203
British National Electrics, Ltd., Newarthill, Motherwell .. .. C 322
British Non-Ferrous Metals Federation, 132, Hagley Road, Birmingham, 16 .. .. D 219
British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2 .. C 511 & 410
British Trane Co., Ltd., Vectair House, 52, Clerkenwell Close, London, E.C.1 .. .. B 324
British Vacuum Cleaner & Engineering Co., Ltd., Goblin Works, Leatherhead .. A 520 & D 203 & 102
Brook Motors, Ltd., Empress Works, Huddersfield .. .. C 210
Broughton, J., Vere Street, Birmingham, 5 .. D 610
Browett, Lindley, Ltd., Letchworth .. .. .. D 604
Brown, David, & Sons (Huddersfield), Ltd., Park Gear Works, Lockwood, Huddersfield .. D 138
Brown's Clipper Co. (1939), Ltd., Electric Avenue, Witton, Birmingham .. .. .. D 713
Brush Electrical Engineering Co., Ltd., Falcon Works, Loughborough .. .. .. C 709 & 608
Bulpitt & Sons, Ltd., St. George's Works, Icknield Street, Birmingham, 1 .. A 417 & C 506
Buncher & Haseler, Ltd., Branston Street, Birmingham .. .. A 630
Burco, Ltd., Rose Grove, Burnley .. .. C 312
Burton Holt (Chelsea), Ltd., Goudhurst, Kent A 305
B.V.C. Industrial Constructions, Ltd., Africa House, Kingsway, London, W.C.2 .. D 203 & 102

Cable Makers' Association, 52-54, High Holborn, London, W.C.1 .. .. C 413 & 316
Cabl & Wireless, Ltd., Electra House, Victoria Embankment, London, W.C.2 .. .. C 223
Calorizing Corporation of Great Britain, Ltd., 32, Farringdon Street, London, E.C.4 D 407 & 306
Campbell Engineering Co., Ltd., Sherman Road, Bromley, Kent .. .. A 326
Canning, W., & Co., Ltd., Great Hampton Street, Birmingham .. .. .. D 207 & 106
Capon Heaton & Co., Ltd., Hazelwell Mills, Stirchley, Birmingham, 30 .. .. .. D 710
C.A.V., Ltd., London, W.3 .. .. C 501
C.A.V., Ltd., Smethwick .. .. C 604
Channel Conduits, Ltd., 156, Great Portland Street, London, W.1 .. .. B 300
Chloride Electrical Storage Co., Ltd., Exide Works, Clifton Junction, near Manchester .. C 417
Christy & Norris, Ltd., Chelmsford, Essex .. D 403
Clang, Ltd., Crown Yard, London, N.W.2 .. C 207
Clarkson Thimble Tube Co., Ltd., 15, Fetter Lane, London, E.C.4 .. .. .. D 407 & 306
Coa Products, 34, South Molton Street, W.1 .. B 618
Cohen, George, Sons & Co., Ltd., Wood Lane, London, W.12 .. .. D 604
Cole, E. K., Ltd., Ekco Works, Southend-on-Sea C 310
Coleman & Appleby, Ltd., 119-127, Constitution Hill, Birmingham .. .. D 211
Collis & Sons, J., Ltd., 42-43, Regent Square, Gray's Inn Road, London, W.C.1 .. .. D 522
Connollys (Blackley), Ltd., Manchester, 9 C 413 & 316
Constructors, Ltd., Nickel Works, Tyburn Road, Birmingham, 24 .. .. .. D 401 & 300
Co-operative Wholesale Society, Ltd., 1, Balloon Street, Manchester .. .. B 711 & 620
Copper Development Association, Grand Buildings, Trafalgar Square, London, W.C.2 .. D 230
Counting Instruments, Ltd., 91, Regent Street, London, W.1 .. .. D 111
Craigpark Electric Cable Co., Ltd., Flemington Street, Springburn, Glasgow .. .. C 413 & 316
Critchley Bros., Ltd., Wimberley Mills, Brimscombe, Stroud, Glos. .. .. A 318
Crittall, Richard, & Co., Ltd., 156, Great Portland Street, London, W.1 .. .. .. B 300
Crompton Parkinson, Ltd., Astor House, Aldwych, London, W.C.2 .. A 327 & 226, B 308a & C 413 & 316
Cruickshank, R., Ltd., Camden Street, Birmingham .. .. D 226
C.S.A. Industries, Ltd., Avon Works, Wharf Street, Warwick .. .. B 313
Cunliffe-Owen Aircraft, Ltd., 34, South Molton Street, London, W.1 .. .. B 618
Cyc-Arc, Ltd., Stelmar House, New North Road, London, N.1 .. .. C 110
Daniels, T. H. & J., Ltd., Lightpill Iron Works, Stroud, Glos. .. .. D 216
Danks, Edwin, & Co. (Oldbury), Ltd., Oldbury D 407 & 306
Davis, John, & Son (Derby), Ltd., All Saints Works, Derby .. .. A 327 & 226
Davis & Timmins, Ltd., Billet Road, E.17 .. C 114
Delepena & Son, Ltd., Zona Works, Russell Place, Cheltenham .. .. D 234
Dennis, G. P., Ltd., Fleming Road, Speke, Liverpool .. .. C 718
Derby Cables, Ltd., Alfreton Road, Derby A 327 & 226
Derby for Industry, Corporation St., Derby A 327 & 226
Desoutter Bros., Ltd., The Hyde, Hendon, London, N.W.9 .. .. C 415
Diamond Motors (Wolverhampton), Ltd., Upper Villiers Street, Wolverhampton .. C 227
Dick, R. & J., Ltd., Greenhead Works, Glasgow D 221
Dixon, R. G., & Co., Ltd., Capitol Works, Empire Way, Wembley .. .. .. C 726
Dorman & Smith, Ltd., Ordsal Electrical Works, Salford .. .. C 108
Downham, S. J., & Co., Ltd., Stone Court Works, Lower Green, Pembury, Kent .. B 505
D.P. Battery Co., Ltd., Bakewell, Derbyshire .. C 711
D.S. Plugs, Ltd., Ordsal Electrical Works, Manchester, 5 .. .. C 108
Dulrae Manufacturing Co., Ltd., 156, Great Portland Street, London, W.1 .. .. B 300
Dunlop Rubber Co., Ltd., Cambridge Street, Manchester .. .. D 519
Dunlop Special Products, Ltd., 1, Albany Street, London, N.W.1 .. .. D 220
Duralite, Ltd., 25, Manchester Square, W.1 .. C 403

Eadon, A. J., & Co., Ltd., 173, Brompton Road, London, S.W.3 .. .. A 632
Edison Swan Electric Co., Ltd., 155, Charing Cross Road, London, W.C.2 .. .. C 413 & 316
Ekco-Ensign Electric, Ltd., Ekco Works, Southend-on-Sea .. .. C 310
Electric Construction Co., Ltd., Bushbury Engineering Works, Wolverhampton .. .. C 708
Electric Furnace Co., Ltd., and Electric Resistance Furnace Co., Ltd., Netherby, Queen's Road, Weybridge .. .. C 611
ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1 .. .. **C 614**
Electro-Chemical Engineering Co., Ltd., Netherby, Queen's Road, Weybridge .. C 611
Electro Hydraulics, Ltd., Liverpool Road, Warrington .. .. D 717 & 616
Electrolux, Ltd., 153-155, Regent Street, W.1 .. C 734
Electromagnets, Ltd., Boxmag Works, Bond Street, Birmingham, 19 .. .. C 605
Electro Methods, Ltd., 112, Brent Street, London, N.W.4 .. .. C 730
Elfson, Ltd., Tyburn Road, Birmingham .. A 609
Elliott Bros. (London), Ltd., London, S.E.13 .. D 114
E.M.B. Co., Ltd., Moor Street, West Bromwich D 134
E.M.I. Factories, Ltd., Hayes, Middlesex .. C 516
Enfield Cables, Ltd., Millmarsh Lane, Brimsdown, Enfield .. .. C 413 & 316
English Electric Co., Ltd., Queen's House, Kingsway, London, W.C.2 .. .. C 613 & 512
Eralite Manufacturing Co., Ltd., 194, Broadway, London, S.W.19 .. .. C 304
Ether, Ltd., Tyburn Road, Erdington .. .. C 700
Expanded Metal Co., Ltd. Burwood House, Caxton Street, London, S.W.1 .. .. C 617

Falk, Stadelmann & Co., Ltd., 91, Farringdon Road, London, E.C.1 .. .. C 208
Ferguson, Pailin, Ltd., Manchester, 11 .. .. C 622
Ferranti, Ltd., Hollinwood, Lancs .. C 615 & 514
Ferro Enamels, Ltd., Ounsdale .. .. B 515
Fescol, Ltd., North Road, London, N.7 .. D 742
Finney Presses, Ltd., New Eagle Engineering Works, 27-31, Berkley Street, Birmingham, 1 D 140
Firth-Vickers Stainless Steels, Ltd., Staybrite Works, Sheffield, 9 .. .. .. D 419 & 320
Fisher, H., (Oldham), Ltd., Glodwick Road, Oldham .. .. C 706
Fisher & Ludlow, Ltd., Albion Works, Kingsbury Road, Birmingham, 24 .. .. .. D 303 & 202
Flextol Engineering Co., The Green, W.5 .. D 231
Foster, Yates, & Thom, Ltd., Blackburn .. D 504

Fowler, John, (Leeds), Leeds .. .. C 329 & 228
French, W. T., & Son, Ltd., Mysto Works, Browning Street, Ladywood, Birmingham .. A 433
Fusarc, Ltd., Kingsway, Team Valley, Gateshead-on-Tyne .... C 705

Gascoignes (Reading), Ltd., Gascoignes House, Berkeley Avenue, Reading .. D 715 & 614
General Accessories Co., Ltd., 21, Bruton Street, London, W.1 .. .. C 106
General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2 .. .. C 503 & 402
Gent & Co., Ltd., Faraday Works, Leicester .. C 407
Gill, Edward, 52-54, Hylton Street, Vyse Street, Birmingham, 18 .. .. A 648
Gillott Electro-Steam Cookers, Ltd., Cotswold Works, Chalford, Glos. .. .. .. A 318
Gilman, F., (B.S.T.), Ltd., 195, High Street, Smethwick .. .. D 506
Girdlestone Pumps, Ltd., 23, Davies Street, London, W.1 .. .. D 333
Gittings & Hills, Ltd., Tower Varnish Works, Lond Acre, Birmingham, 6 .. .. .. B 322
Glostics, Ltd., Tuffley Crescent, Gloucester .. D 500
Glover, W. T., & Co., Ltd., Trafford Park, Manchester, 17 .. .. C 413 & 316
Green, E., & Son, Ltd., Calder Vale Road, Wakefield .. .. B 504
Greengate & Irwell Rubber Co., Ltd., Greengate Works, Manchester, 3 .. .. .. C 413 & 316
Grierson, Ltd., 195-203, Waterloo Road, S.E.1 B 300
Grimsley & Co. (Leicester), Ltd., Nichol Street, Leicester .. .. D 103a
Guest, Keen & Nettlefolds, Ltd., Heath Street, Birmingham .. .. B 627 & 526
Guests Brass Stamping Co., Birmingham, 29 .. D 732
G.W.B. Electric Furnaces, Ltd., Dibdale Works, Dudley, Worcs. .. .. C 321 & 220

Hague & McKenzie, Ltd., Pyramid Works, Sloane Street, Birmingham .. .. .. C 502
Hailwood & Ackroyd, Ltd., Beacon Works, Morley, Yorks .. .. C 602
Hancock & Co. (Engineers), Ltd., Progress Way, Croydon .. .. D 739 & 638
Harvey-Frost & Co., Ltd., Dunmow Road, Bishops Stortford .. .. .. D 405 & 304
Harvey, G. A., & Co. (London), Ltd., Woolwich Road, London, S.E.7 .. .. .. B 329
Heayberd, F. C., & Co., Ltd., 28, Russell Square, London, W.C.1 .. .. C 610
Hellerman Electric, Ltd., Goodtric Works, 6, Brewer Street, Oxford .. .. C 217
Henley's, W. T., Telegraph Works Co., Ltd., 51-53, Hatton Garden, London, E.C.1 C 413 & 316
Herbert, Alfred, Ltd., Coventry D 310, 319 & 216
Hi-Craft Electrical Products, Ltd., 25, Manchester Square, London, W.1 .. .. C 403
Higgs Motors, Ltd., Witton, Birmingham, 6 .. D 601
Holden & Hunt, Old Hill, Staffs .. C 719 & 618
Hoover, Ltd., Perivale, Middlesex .. .. C 714
Hopkins, E. C., Ltd., Grosvenor Street West, Birmingham, 16 .. .. D 741
Horstmann Gear Co., Ltd., 93, Newbridge Road, Bath .. .. C 606
Hotpoint Electric Appliance Co., Ltd., Crown House, Aldwych, London, W.C.2 .. .. C 513
Hotric, Ltd., Broxburn, West Lothian .. .. C 203
Hufton, Charles, & Sons, Ltd., Conybere Street, Birmingham, 12 .. .. A 324
Hurley Machine Co. (England), Ltd., 55-59, Oxford Street, London, W.1 .. .. .. C 612
Hussmann British Refrigeration, Ltd., 19, Grosvenor Place, London, S.W.1 .. .. .. A 633
Hyde, Silas, Ltd., Greet Works, Evelyn Road, Birmingham, 11 .. .. C 723

Iddon, Victor H., Ltd., Harper Road, Wythenshawe .. .. C 107
Imperial Chemical Industries, Ltd., Nobel House, Buckingham Gate, London, S.W.1 D 312, 315, 212, 409 & 308
Impregnated Diamond Products, Ltd., Tuffley Crescent, Gloucester .. .. D 500
India Rubber, Gutta Percha & Telegraph Works Co., Ltd., Vincent Square, London, S.W.1 C 413 & 316 & D 615
International Combustion, Ltd., 19, Woburn Place, London, W.C.1 .. .. A 327 & 226 & D 331, 228 & 241
Invicta Electrodes, Ltd., Willenhall, Staffs D 717 & 616
Ioco Co., Ltd., Netherton Works, Glasgow, W.3 D 701

Jackson Electric Stove Co., Ltd., 143, Sloane Street, London, S.W.1 .. .. C 411 & 314
Jenson & Nicholson, Ltd., 36, St. James's Street, London, S.W.1 .. .. B 200
Johnson, Matthey & Co., Ltd., Hatton Garden, London, E.C.1 .. .. D 100
Johnson & Phillips, Ltd., Victoria Way, London, S.E.7 .. .. C 322, 413 & 316
Johnson, Richard, & Nephew, Ltd., Forge Lane, Manchester, 11 .. .. B 417 & 316
Jones, E. H., (Machine Tools), Ltd., Edgware Road, London, N.W.9 .. .. .. D 612

Kango Electric Hammers, Ltd., Morden Factory Estate, London, S.W.19 .. .. D 720
Kaufmann, H., Ltd., 13, St. Andrew Street, London, E.C.4 .. .. A 607 & 504
Kieft, Cyril, & Co., Ltd., Bridgend, South Wales A 311
King, George W., Ltd., Hartford Works, Hitchin D 404
K. & L. Steelfounders & Engineers, Ltd., Coborn Works, Letchworth .. .. D 604

Lan Bar, Ltd., Seymour Street, Birmingham 12 A 635
Langley Alloys, Ltd., 4, Station Road, Langley, Slough .. .. D 243
Langley (London), Ltd., 161, Borough High Street, London, S.E.1 .. .. C 226
Leeds Metal Spinning Co., Ltd., 26, Leeds Bridge, Leeds .. .. A 523 & 418
Legg (Industries), Ltd., Williamson Street, Wolverhampton .. .. C 231
Ley's Malleable Castings Co., Ltd., Colombo Street, Derby .. .. D 513 & 410
Liverpool Electric Cable Co., Ltd., 24, Queen Anne's Gate, London, S.W.1 C 320, 413 & 316
Locker, Thomas, & Co., Ltd., Warrington .. B 522
Lockers (Engineers), Ltd., Warrington, Lancs. . D 502
Londex, Ltd., 207, Anerley Road, S.E.20 .. C 722
London Aluminium Co., Ltd., Westwood Road, Birmingham, 6 .. .. A 411 & 312
London Electric Wire Co. & Smiths, Ltd., 24, Queen Anne's Gate, London, S.W.1 C 320, 413 & 316
Longlamps, Ltd., 24, Marshalsea Road, S.E.1 .. C 100
Lucas, Joseph, Ltd., Great King Street, Birmingham, 19 .. .. C 501
Ludlow Bros., Ltd., 202 Fazeley Street, Birmingham, 5 .. .. A 313
Lundberg, A. P., & Sons, Ltd., 491-493, Liverpool Road, London, N.7 .. .. C 507 & 406

McGeoch, Wm., & Co., Ltd., 46, Coventry Road, Birmingham, 10 .. .. C 325
Macintosh Cable Co., Ltd., 53-54, High Holborn, London, W.C.1 .. .. .. C 413 & 316
MacPherson, Donald, & Co., Ltd., 21, Albion Street, Manchester, 1 .. .. B 525
Macrome, Ltd., Aldersley, Wolverhampton .. D 746
Magnetic Valve Co., Ltd., 152, Great Portland Street, London, W.1 .. .. B 300
Manuus Manufacturing Co., Ltd., 270-276, Bearwood Road, Smethwick .. .. .. B 309 & 208
Marconi Instruments, Ltd., Electra House, Victoria Embankment, London, W.C.2 .. D 507
Martindale Electric Co., Ltd., Westmorland Road, London, N.W.9 .. .. C 732
Matthews & Yates, Ltd., Cyclone Works, Swinton, Manchester .. .. D 705
Measure-Meters Co., Ltd., Sunnyside, Leicester Road, Salford, 7 .. .. D 740
Mersey Cable Works, Ltd., Linacre Lane, Liverpool, 20 .. .. C 507 & 406
Metalectric Furnace, Ltd., Cornwall Road, Smethwick .. .. C 725 & 624
Metallization Ltd., Barclays Bank Chambers, Dudley .. .. D 218
Metal Sections, Ltd., Oldbury .. .. D 619 & 518
Metropolitan Electric Cable & Construction Co., Ltd., Clyde Works, Chadwell Heath C 413 & 316
Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester .. .. .. C 510
Metway Electrical Industries, Ltd., King Street, Brighton .. .. C 302
Midland Fan Co., Ltd., 212, Aston Road, Birmingham, 6 .. .. A 622
Midland Metal Spinning Co., Ltd., Tower Works, Pelham Street, Wolverhampton A 513 & 410

Midland Repetition & Auto Manufacturing Co., Ltd., Blackhouse Road, Longford, Coventry A 604
Ministry of Supply, Shell Mex House, W.C.2 .. D 743
Mirrlees Watson Co., Ltd., 45, Scotland Street, Glasgow .. .. D 535
Moffats, Ltd., Skew Bridge, Blackburn .. C 505
"Monitor" Patent Safety Devices, Ltd., King's Road, Walsend-on-Tyne .. .. .. D 534
Mono Pumps, Ltd., 67, Clerkenwell Road, London, E.C.1 .. .. D 716
Morgan Crucible Co., Ltd., Battersea Church Road, London, S.W.11 .. .. D 305 & 204
Morgan Ebonite Co., Ltd., Bank Mill, Failsworth, Manchester .. .. D 615
Morris, B. O., Ltd., Morrisflex Works, Clay Lane, Coventry .. .. D 515
Moseley, David, & Sons, Ltd., Chapelfield Works, Manchester, 12 .. .. .. D 640
Moss Gear Co., Ltd., Crown Works, Chester Road, Birmingham, 24 .. .. .. D 428
Moulded Products, Ltd., Chester Road, Birmingham, 24 .. .. D 738
Murex, Ltd. and Murex Welding Processes, Ltd., Hertford Road, Waltham Cross .. D 247 & 144

Neon Electric Co., Ltd., 24, Marshalsea Road, London, S.E.1 .. .. C 100
Neville's (Liverpool), Ltd., Purley Way, Croydon D 119
Newage (Manchester), Ltd., 281-289, Bury New Road, Manchester, 7 .. .. D 625
New Process Welders, Ltd., 76, Victoria Street, London, S.W.1 .. .. D 118
Newman Industries, Ltd., Yate, Bristol .. D 306
Newton Bros. (Derby), Ltd., Alfreton Road, Derby .. .. A 327 & 226
Newton, L. H., & Co., Ltd., Birmingham, 7 .. C 212
Northern Aluminium Co., Ltd., Wellington House, Lancaster Place, London, W.C.2 .. D 629
Northern Rubber Co., Ltd., Victoria Works, Retford, Notts .. .. D 730

Ocean Radiator Co., Ltd., 99a, Park Lane, London, W.1 .. .. D 303 & 202
Oldham & Son, Ltd., Denton, near Manchester C 414
Omes, Ltd., Beverley Works, Willow Avenue, London, S.W.13 .. .. D 533
Ormond Engineering Co., Ltd., Ormond House, Rosebery Avenue, London, E.C.1 .. .. C 205
Osborn Manufacturing Co., Ltd., 513, Highgate Square, Birmingham, 12 .. .. .. C 111

Parker, Winder & Achurch, Ltd., 251, Broad Street, Birmingham, 1 .. .. B 606
Parnall (Yate), Ltd., 43, Park Street, W.1 .. C 101
Partridge, Wilson & Co., Ltd., Evington Valley Road, Leicester .. .. C 305
P.B. Sillimanite Co., Ltd., Atlas Road, N.W.10 C 620
Peglers, Ltd., Belmont Works, Doncaster .. B 421
Perry Barr Metal Co., Ltd., Oscott Works, Great Barr, Birmingham, 22A .. .. .. D 725
Philips Electrical, Ltd., Century House, Shaftesbury Avenue, London, W.C.2 .. .. .. C 609
Phœnix Sales, Ltd., Winton House, St. Andrew Street, London, E.C.4 .. .. .. A 607 & 504
Pinchin, Johnson & Associates, Ltd., 15, Clifford Street, London, W.1 .. .. B 625
Pirelli-General Cable Works, Ltd., Western Shore, Southampton .. .. .. C 413 & 316
Pneulec, Ltd., Mafeking Road, Smethwick .. D 626
Poles, Ltd., Nickel Works, Tyburn Road, Birmingham .. .. C 323
Power Centre Co., Ltd., Lloyd Street, Wednesbury .. .. C 707
Premier Electric Heaters, Ltd., Keeley Street, Birmingham .. .. C 206
Pressed Steel Co., Ltd., Cowley, Oxford C 303 & 204
Pritchett & Gold & E.P.S. Co., Ltd., 50, Grosvenor Gardens, London, S.W.1 .. .. .. C 732
Pyrotenax, Ltd., Hebburn-on-Tyne C 724 & D 534

Quaker, Silas, Ltd., Crown Yard, London, N.W.2 .. .. C 207
Quasi-Arc Co., Ltd., Bilston, Staffs .. C 317

Radio Heaters, Ltd., Wokingham .. .. C 221
Ramus Manufacturing Co., Ltd., 66, Buttesland Street, London, N.1 .. .. B 612
Rapid Magnetting Machine Co., Ltd., Magnet Works, Lombard Street, Birmingham, 12 .. C 409
Rawlplug Co., Ltd., Cromwell Road, S.W.7 .. C 703
"Ray-Heat-"ing Co. Ltd., Rayleigh Works, Station Road, Leatherhead .. .. .. C 235
Record Electrical Co., Ltd., Broadheath, near Manchester .. .. C 720
Revo Electric Co., Ltd., Tipton, Staffs .. C 301 & B & D Outdoor
Reynolds Tube Co., Ltd., Hay Hall Works, Tyseley, Birmingham .. .. .. D 621 & 520
Reyrolle, A., & Co., Ltd., Hebburn-on-Tyne .. C 405
Rheostatic Co., Ltd., Farnham Road, Slough C 500
Rhodes, Joseph, & Sons, Ltd., Grove Ironworks, Wakefield .. .. D 323
Rhymney Engineering Co., Ltd., 19, Woburn Place, London, W.C.1 .. .. .. D 331, 228 & 241
Riley Stoker Co., Ltd., 19, Woburn Place, London, W.C.1 .. .. D 241
"Riva" Fireplace Co., Ltd., Duke Street, Fenton, Stoke-on-Trent .. .. .. B 707
Robot Glass Cleaner Co., Ltd., 71, Edmund Street, Birmingham, 3 .. .. .. C 224
Rollnick & Gordon, Ltd., Capitol Works, Empire Way, Wembley .. .. .. C 726
Rotherham & Sons, Ltd., 27, Spon Street, Coventry .. .. D 624
Rowell, J., & Son, Ltd., Thermecon Works, Boyd Street, Newcastle-upon-Tyne, 2 A 650 & D 534
Rozalex, Ltd., 10, Norfolk Street, Manchester, 2 D 706
Ruberoid Co., Ltd., 1-19, New Oxford Street, London, W.C.1 .. .. B 423
Rubery Owen & Co., Ltd., Darlaston .. D 717 & 616
Rudd, E., & Co., Ltd., Island Works, Holyhead Road, Birmingham, 21 .. .. .. C 216
Runbaken Electrical Products, 71-73, Oxford Road, Manchester, 1 .. .. C 728
Ryland Works, Ltd., Ryland Works, Chesterfield A 519

St. Helens Cable & Rubber Co., Ltd., Trading Estate, Slough, Bucks .. C 413 & 316 &D 745
Sankey, J. H., & Sons, Ltd., Aldwych House, Aldwych, London, W.C.2 .. .. .. B 406
Schori Metallising Process, Ltd., Brent Crescent, North Circular Road, London, N.W.10 D 524
Sciaky Electric Welding Machines, Ltd., Farnham Road, Slough, Bucks .. .. .. C 222
Scottish Cables, Ltd., Deanside, Renfrew .. C 319
Senior Economisers, Ltd., 11, Southampton Row, London, W.C.1 .. .. D 241
Sharp Control Gear, Ltd., 26, Redditch Road, Birmingham, 30 .. .. C 211
Sheffield Smelting Co., Ltd., Royds Mill Street (P.O. Box 28), Sheffield, 4 .. .. .. D 731
Siemens Bros. & Co., Ltd., Woolwich, S.E.18 C 413 & 316
Sigmund Pumps, Ltd., Team Valley, Gateshead, 11 .. .. D 337
Simmonds Aerocessories, Ltd., Treforest, Glam D 427
Simplex Electric Co., Ltd., Broadwell, Oldbury C 507 & 406
Smart & Brown (Engineers), Ltd., 25, Manchester Square, London, W.1 .. .. C 403
Smellie, James, Ltd., Ivanhoe Works, Dudley.. B 628
Smith, Frederick, & Co., 24, Queen Anne's Gate, London, S.W.1 .. .. C 320
Smith's Industrial Instruments, Ltd., Cricklewood Works, London, N.W.2 .. .. D 727
Spencer-Bonecourt, Ltd., Babcock House, Farringdon Street, London, E.C.4 .. D 407 & 306
Spiral Tube & Components Co., Ltd., Osmaston Park Road, Derby .. A 327 & 226 & D 708
tandard Telephones & Cables, Ltd., 63, Aldwych, London, W.C.2 .. C 225, 104, 413 & 316
Stanton Ironworks Co., Ltd., near Nottingham B 717 & 626 & B Outdoor
Steels Engineering Products, Ltd., Steel & Co., Ltd., Steels Electrical Products, Ltd., and Steel & Co., Pressings, Ltd., Crown Works, Sunderland .. .. B 617 & D Outdoor
Stephens Belting Co., Ltd., Snow Hill, Birmingham, 4 .. .. D 233
Sterling Cable Co., Ltd., Queensway, Ponders End .. .. C 233
Stewarts & Lloyds, Ltd., Broad Street Chambers, Birmingham .. .. D 511 & 408
Stirling Boiler Co., Ltd., 32, Farringdon Street, London, E.C.4 .. .. D 407 & 306
Stott, James, & Co. (Engineers), Ltd., Vernon Works, Oldham .. .. .. C 727 & 626

Sturdy Electric Co., Ltd., Dipton, Newcastle-on-Tyne .. .. D 534
Summerscales', W. & S., Sons, Parkside Works, Keighley .. .. A 521
Sumo Pumps, Ltd., Lighthouse Works, Smethwick .. .. C 604
Taylor & Challen, Ltd., Constitution Hill, Birmingham, 19 .. .. D 415
Taylor & Wilson, Ltd., Taywil Works, Accrington, Lancs .. ..

Duratube & Wire, Ltd., Faggs Road, Feltham, Middlesex .. .. .. Earls Court Q 11

Easco Electrical, Ltd., 6-8, Brighton Terrace, London, S.W.9 .. .. H 3

Eastick, J. J., & Sons, Ltd., 12, Errol Street, London, E.C.1 .. .. H 47

Ebonestos Industries, Ltd., Excelsior Works, Rollins Street, Ilderton Road, London, S.E.15 Earls Court Q 43

Edison Swan Electric Co., Ltd., 155, Charing Cross Road, London, W.C.2 .. .. .. H 25

Edwards, W., & Co. (London), Ltd., Kangley Bridge Road, Lower Sydenham, London, S.E.26 .. .. C 38

Ekco-Ensign Electric, Ltd. (See E. K. Cole, Ltd.) .. .. C 310

Elco Clocks & Watches, Ltd., 51, Hatton Garden, London, E.C.1 .. .. J 182

Electric Art Shades (1928), Ltd., Feering Factory, Kelvedon, Essex .. .. K 6

Electric & Musical Industries, Ltd., Hayes, Middlesex .. .. H 14

Electrical & Radiological Instrument Co., Ltd., 54, Church Road, London, W.3 .. .. H 2

Electrix, Ltd., Sterling Works, Dagenham .. Earls Court X 7

Electrolux, Ltd., 153, Regent Street, London, W.1 .. .. Earls Court X 2

English Glass Co. Ltd., Empire Road, Leicester Earls Court R 19

English Numbering Machines, Ltd., 38, Barrett's Grove, Stoke Newington, London, N.16 .. F 43

Evans Electroselenium, Ltd., Westminster Bank Chambers, Bishop's Stortford .. .. C 51

General Chemical & Pharmaceutical Co., Ltd., Judex Works, Sudbury, Middlesex .. .. B 55

General Lighting Equipment Co., Ltd., 99, Great Eastern Street, London, E.C.2 Earls Court V 89

Glauser, J. M., & Sons, Ltd., Bridge Buildings, Bensham Manor Road, Thornton Heath .. Earls Court X 8

Goodman Industries, Ltd., Lancelot Road, Wembley .. .. H 61

Hailwood & Ackroyd, Ltd., Beacon Works, Morley, Yorks .. .. .. Earls Court R 14

Hale Electric Co., Ltd., Talbot Road, West Ealing, London, W.13 .. .. H 22

Hanovia, Ltd., 3, Victoria Street, London, S.W.1 C 72

Hilger & Watts, Ltd., 123, Camberwell Road, London, S.E.5 .. .. C 40

Hollmann, Oswald, 208, Kent House Road, Beckenham .. .. K 71

Hoover, Ltd., 211-213, Regent Street, London, W.1 .. .. Earls Court X 1

I.C.I. Plastics, Ltd., Black Fan Road, Welwyn Garden City, Herts .. Earls Court Q 42 & 49

Ideal Home Electrical Appliances, Ltd., 45, Great Ormond Street, London, W.C.1 .. C 84

Injection Moulders, Ltd., Westmoreland Road, The Hyde, London, N.W.9 .. Earls Court Q 46

Insulators, Ltd., Leopold Road, Angel Road, Edmonton, London, N.18 .. Earls Court Q 39

Lamson Engineering Co., Ltd., Hythe Road, London, N.W.10 .. .. F 41 & 44

Lighting Glass Manufacturers' Association, 17, Manchester Street, London, W.1 Earls Court R 14

London Industrial Art, Ltd., 33, Jubilee Place, London, S.W.3 .. .. .. Earls Court S 28a

Magneta Time Co., Ltd., Goblin Works, Leatherhead .. .. .. F 22, H 55 & J 120

Manchester Oil Refinery, Ltd., Twining Road, Trafford Park, Manchester, 17 .. .. .. B 39

Marconi Instruments, Ltd., St. Albans, Herts.. C 74

Marconi's Wireless Telegraph Co., Ltd., Marconi House, New Street, Chelmsford .. H 53

Mayfair Shades, Ltd., 90-96, City Road, London, E.C.1 .. .. K 99

Measuring Instruments (Pullin), Ltd., Electrin Works, Winchester Street, Acton, London, W.3 .. .. C 4

Megatron, Ltd., 115a, Font Hill Road, London, N.4 .. .. C 57

Mentmore Manufacturing Co., Ltd., Platignum House, Tudor Grove, London, E.9 Earls Court Q 41

Metamec, Ltd., Dereham, Norfolk .. .. J 167

Mica Products, Ltd., 1 Downs Park Road, Dalston, London, E.8 .. .. Earls Court Q 43

Milliwatt, Ltd., 10, Spring Place, Holmes Road, London, N.W.5 .. .. C 89

Mullard Electronic Products Ltd., Century House, Shaftesbury Avenue, London, W.C.2 H 45

Multitone Electric Co., Ltd., 223-227, St. John Street, London, E.C.1 .. .. H 60

New Welbeck, Ltd., 69, New Bedford Road, Luton .. .. Earls Court X 5

"Ossicaide," 1, Upper Richmond Road, London, S.W.15 .. .. C 80

Peerless & Ericsson, Ltd., 6, Lygon Place, London, S.W.1 .. .. Earls Court T 29

Perihel, Ltd., 17-19, Edge Street, London, W.8 C 102a

Permaheat, Ltd., Spectator Street, Manchester, 4 C 93

Pullin Optical Co., Ltd., Phœnix Works, Great West Road, Brentford, Middlesex .. .. C 105

"Q-max" (Electronics), Ltd., 10, Little Turnstile, London, W.C.1 .. .. H 23

Raymond Electric, Ltd., 26, Wadsworth Road, Perivale, Middlesex .. .. H 51

Rejafix, Ltd., 75, Baker Street, London, W.1 .. E 58

Rev Motors, Ltd., Knowsley House, Bolton .. N 108

Rollnick & Gordon, Ltd., Capitol Works, Empire Way, Wembley .. Earls Court X 6

Sangamo-Weston, Ltd., Great Cambridge Road, Enfield .. .. C 90

Selyac Distributors, Ltd., Forde Road, Newton Abbot .. .. Earls Court T 32

Sifam Electrical Instrument Co., Ltd., Leigh Court, Higher Lincombe Road, Torquay .. C 12

Smiths English Clocks, Ltd., 179-185, Great Portland Street, London, W.1 .. J 102 & 104

Solus-Schall, Ltd., 39a, Welbeck Street, London, W.1 .. .. C 33

Stadium, Ltd., 30-36, Queensway, Ponders End, Enfield .. .. Earls Court Q 29

Sterling-Croydon Clocks, Ltd., Boden Works, Chard, Somerset .. .. J 180

Streetly Manufacturing Co., Ltd., 1, Argyll Street, London, W.1 .. .. Earls Court Q 36

Sunvic Controls, Ltd., 10, Essex Street, London, W.C.2 .. .. C 50

S. & W. (Lighting), Ltd., Church Lane, Dudley Port, Tipton .. .. .. Earls Court R 14

Synchromatic Time Recording Co., Ltd., 65, Erskine Street, Liverpool, 6 .. .. .. J 166

Synchronome Co., Ltd., Abbey Electric Clock Works, Woodside Place, Alperton .. .. J 121

Taylor Electrical Instruments, Ltd., 419, Montrose Avenue, Slough, Bucks .. .. .. H 49

Taylor, Taylor & Hobson, Ltd., Stoughton Street Works, Leicester .. .. .. C 41

Telsen Electric Co. (1935), Ltd., Fitzgeorge Street, Manchester, 9 .. .. H 29

"Thermega," Ltd., 51-53, Victoria Street, London, S.W.1 .. .. C 77

Thorn Electrical Industries, Ltd., 105-109, Judd Street, London, W.C.1 .. .. .. H 48

Tinsley, H., & Co., Ltd., Werndee Hall, South Norwood, London, S.E.25 .. .. .. C 6

T.M.C. - Harwell (Sales), Ltd., 37, Upper Berkeley Street, London, W.1 .. .. J 122

Toplis, Simpson & Co., Ltd., 130, Vaughan Road, Harrow .. .. C 100

Trix Electrical Co., Ltd., 1, Maple Place, London, W.1 .. .. H 42

Ultra Electric, Ltd., 62, Buckingham Gate, London, S.W.1 .. .. H 13

Unicam Instruments (Cambridge), Ltd., Arbury Road, Cambridge .. .. C 1

Vactric, Ltd., Chapelhall Lanarkshire, Earls Court X 3

Waite & Son, Ltd., Menin Works, Bond Road, Mitcham .. .. K 32

Warm-Glow Co., 1133, London Road, Leigh-on-Sea .. .. Earls Court W 12

Webb's Crystal Glass Co., Ltd., 2-3, Norfolk Street, London, W.C.2 .. Earls Court R 14

Westinghouse Brake & Signal Co., Ltd., 82, York Way, London, N.1 .. .. H 21

Whiteley Electrical Radio Co., Ltd., 109, Kingsway, London, W.C.2 .. .. H 54

Woden Transformer Co., Ltd., Moxley Road, Bilston, Staffs .. .. H 50

Woodmet, Ltd., Globe Lane, Dukinfield, Ches K 208

The Birmingham Section

A Stand-by-Stand Guide to Electrical Exhibits

Accles & Pollock, Ltd. (D 619/518).—Tubes in steel, stainless steel and other metals.

A.C.E. Machinery, Ltd. (D 235).—A geared push-button operated skip hoist, a friction hoist with tower platform equipment and a one-ton capstan.

John Ackworthie, Ltd. (D 752).—Horizontal drilling and marking machines.

Acru Electric Manufacturing Co., Ltd. (C 209).—Brazing and welding equipment, electric hand dryers, soldering irons, neon testers, neon bulbs, transformers and starting switches.

Aeraspray Manufacturing Co., Ltd. (D 734).—Spray painting equipment shown for the first time includes the "New Aera" spray gun, pressure paint containers, with built-in pressure regulating valves and pressure gauges, industrial compressors and a water wash spray booth.

Aerlec Aluminium, Ltd. (A 524).—"Beta" electric fires and "Betaware" hollow-ware.

Aerograph Co., Ltd. (D 302).—"Aerograph-Devilbiss" spray-painting guns, spray booths and exhaust fans, and air compressor plants.

Aerox Productions, Ltd. (D 429).—Ceramic pressings, porous and vitreous, for the electrical industry and porous diaphragms for electrolytic processes.

Aidas Electric, Ltd. (C 103).—Special emphasis is laid on types of "Sadia" electric water heaters and immersion heaters suitable for the export market, and "UDB" (under-draining-board) units can be seen with special finishes supplied only for export

Air Ducts, Ltd. (B 300).—See Richard Crittall & Co., Ltd.

Airscrew Co., Ltd. (D 726).—"Aerofoil" section axial flow fans.

Aiton & Co., Ltd. (D 608).—High temperature and pressure steam pipework includes "Corwel" and butt welded pipe joints.

Aladdin Industries, Ltd. (A 428).—Portable electric radiators.

William Allday & Co., Ltd. (D 505).—"Alcosa" electric fans and soldering irons.

Edgar Allen & Co., Ltd. (D 630).—Tools.

Alumilite & Alzak, Ltd., and associated companies, British Anodising, Ltd., and Aluminium Protection Co., Ltd. (A 629).—This company advises on finishing problems.

Aluminium Development Association (C 116).—Various components illustrate the durability of aluminium and its alloys and their resistance to weathering and corrosive attack. Attention is also drawn to the Association's investigations into welding, the use of large aluminium alloy rivets, and the behaviour of plates, beams and sections under load.

Aluminium Industries, Ltd. (A 506).—"Lion" Brand aluminium hollow-ware.

Amplifiers, Ltd. (C 114).—Toggle switches.

Anchor Cable Co., Ltd. (C 413/316).—Cables.

Ashdowns, Ltd. (C 105).—"Ashlam" resin bonded, cotton cloth and asbestos boards for electrical insulation; and silicone bonded glass cloth for high-temperature electrical insulation.

Associated Iliffe Press (D 214).—A general display, shown against brilliantly illuminated photo-montage backgrounds, representing the chief industries served by the thirty-one Iliffe technical, trade and specialized journals.

Austinlite, Ltd. (C 604).—This subsidiary of Chance Brothers, Ltd., makes automatic emergency electrical generating plant. Equipment is supplied for telephone repeater stations, railway signalling, civilian air route beacons and radar stations, etc. The company's heavy-duty rotary switch (30 or 10 A) can be built up into either 1-, 2-, 3-, 4- or 5-cell units, with a very large number of contact combinations.

Auto-Lec Engineering Co. (A 327/226).—Electric potato peelers of 14 and 25 lb (6·4 and 11·4 kg) capacity have detachable abrasive liners.

Autometric Pumps, Ltd. (D 503).—Positive displacement pumps, exhausters and low-pressure compressors.

W. & T. Avery, Ltd. (D 523/420).—Besides counting scales there are machines for testing compression hardness and impact dynamic balancing, and dynamic fatigue.

Babcock & Wilcox, Ltd. (D 407/306).—This company specializes in everything for the boiler-house—boilers of all types, pulverized fuel firing equipment, stokers, heat exchangers, pressure vessels, the "Calorizing" process and "Calmet" alloy.

Bakelite, Ltd. (C 404).—Examples of the use of laminated bakelite in the electrical industry range from the tubular housings of Westinghouse metal rectifiers to cases for test sets and scientific instruments, from bus-bar separators to bed-plate insulation on alternators. The use of "Vybak" materials for cable covering is of special interest. A new development, "Vybak" rigid sheet, is a vinyl material which may be clear, translucent or opaque, is an excellent electrical insulator and can readily be machined.

"Bank" Hardware Manufacturing Co., Ltd. (A 325).—Electric irons, kettles and fires.

Barford (Agricultural), Ltd. (A 307).—An electric boiler and a sterilizing chest for dairy utensils appear among a display of farm equipment.

Barlow-Whitney Ltd. (C 115).—Electrically heated industrial equipments include furnaces, ovens, hot-oil circulators, oil preheaters, hot-cupboards, tinning and lead baths, air heaters and industrial kettles.

Barries Electrical Agencies, Ltd. (C 302).—"Barlecta" cables and flexibles, adhesive thread, bell pushes, "Stanton" switchgear and other electrical accessories.

James Barwell, Ltd. (B 521).—Electric gongs, steam valves and boiler mountings, etc.

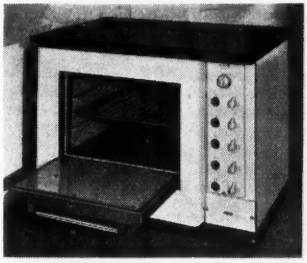
B.B. Chemical Co., Ltd. (D 115).—"Bostik" industrial adhesives and sealing compounds.

Belling & Co., Ltd. (C 515).—On a stand designed particularly to attract overseas buyers are cookers incorporating the latest improvements, and fires of modern and antique design.

Belling & Lee, Ltd. (C 710).—Of special interest among electrical and radio components are a new quick make and break thermostat for electric blankets, a compact television aerial, a thermal cut-out for motor protection, a redesigned ignition suppressor for petrol vehicles, a new 2-pin plug, and a co-axial outlet box.

Bendix Home Appliances, Ltd. (D 303/202).—The Bendix "Home Laundry" is completely automatic. It washes the clothes, rinses three times, and then damp dries them. Finally, it cleans, drains and shuts itself off.

Benham & Sons, Ltd. (B 320).—A heavy-duty electric range of the type chosen for Buckingham



Benham heavy-duty range as installed in Buckingham Palace

Palace (illus.), is shown. Other general-purpose and pastry ovens, grills and toasters are also to be seen.

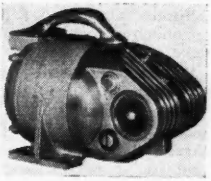
James Beresford & Son, Ltd. (C 214).—A comprehensive display of pumps includes submersible electric deep well models, centrifugal self-priming pumps, multi-stage boiler feed units, sump and suds pumps.

Lewis Berger & Sons, Ltd. (B 619/518).—Of special interest among industrial finishes are the hammered, spattered and diffused effects produced by the one-coat process; also the new "Bergermaster" luxury decorative finish.

Berry's Electric, Ltd. (C 229).—With a complete new range of "Magicoal" fires designed chiefly for the American market is the company's first twentieth-century "Period Model", a striking modern design, simple in conception but executed in the more generous style of the past. A greatly increased range of lighting fittings includes examples of British decorative glass; fittings of carved wood, hewn oak, wrought iron and brass; standard and table lamps; fabric shades; and a new departure, hand gilded stoneware. "Viking" switchgear is also displayed.

F. H. Biddle, Ltd. (B 324).—See British Trane Co., Ltd.

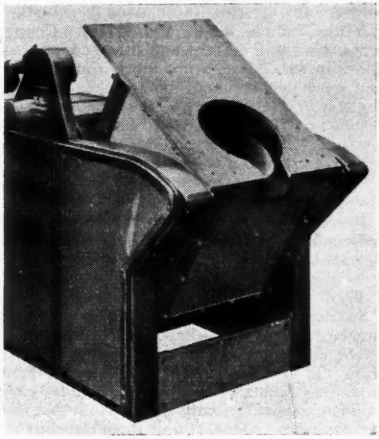
B.I.F. Engineering Co. (1940), Ltd. (A 622).—A small self-contained portable compressor unit (illus.) with a ½-h.p. motor is capable of holding a continuous spray from a small pistol at 40 lb per sq in. (2·8 kg. per cm²). It is also suitable for general garage work.



Portable self-contained compressor (B.I.F. Engineering Co. (1941))

Birkbys, Ltd. (C 307).—"Elo" phenolic products comprise complete mouldings; moulding powders; resins for bonding, laminating and impregnating purposes; insulating varnishes; cements and lacquers, etc.

Birlec, Ltd. (D 509/406).—Exhibits here are confined to special model and photographic displays of the more interesting and latest phases of electric furnace design—gaseous malleable annealing, steel melting (direct and indirect arc), induction heating and melting, pottery firing, gas carburizing and copper brazing. The gaseous annealing process for whiteheart malleable castings makes it possible to reduce the annealing cycle from 5 days to about 48 hours. A new continuous conveyor kiln for glost firing and decorating earthenware and china makes a 4 to 8 hour firing cycle



Birlec high-frequency melting furnace, 200-lb capacity, for non-ferrous metals

possible instead of 24 to 36 hours by other methods. High-frequency induction heating equipment demonstrates automatic feeding and timing devices.

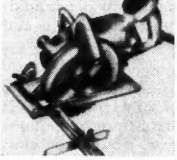
Birmid Industries, Ltd. (D 725).—Examples of products of the six companies in the Birmid group include gravity die castings in aluminium and magnesium for motor end shields, cooker parts, switch boxes and covers and machine moulded castings in high-duty irons for refrigerators, compressors, pumps, etc.

Birmingham Battery & Metal Co., Ltd. (D514).—Condenser tubes in " Batalbra " or in cupronickel ; also large ferrules and condenser plates.

Birmingham Electric Supply (C 509/408).—See British Electrical Development Association.

Bitulac, Ltd. (B 702).—A pictorial panel traces the manufacture of paint through all its stages. Battery boxes are shown sealed with " Bitulac " battery sealing compound.

Black & Decker, Ltd. (C 607).—The " Ripsnorter " saw (illus.) is demonstrated cutting through a piece of box-form asbestos roofing. The new 16-gauge " Lectro-Shear " cuts all types of sheet material. The 2-in portable electric hammer has been redesigned to give added power. Electric screwdrivers, portable drills, drill stands, bench and portable grinders, disc sanders and valve master refacer can also be seen.



Black & Decker " Ripsnorter " saw

Blending Machine Co., Ltd. (C 605).—Magnetic separation equipment for the plastics, foundry, food, chemical milling and other industries.

E. W. Bliss (England), Ltd. (D 603).—Power presses and automatic can-making machinery.

Bolton, Thomas, & Sons, Ltd. (D123).—Copper, brass, phosphor bronze and other copper-base alloys in wire, sheet, strip, tubes, rods, sections and machined components, together with dies for drawing.

Bowthorpe Electric Co., Ltd. (C 217).—Exhibits include overhead-line fittings, testing instruments and solderless cable ferrules. New press tools demonstrated enable ferrules to be shaped, pierced and fitted in a single operation.

Bradley & Turton, Ltd. (D 239).—A 100-ton, self-contained, semi-automatic, electrically operated, hydraulic plastic moulding press is seen in operation.

Bratt Colbran, Ltd. (C 504).—In the new " Sunrise " fire (illus.), displayed in a modern fireplace suite with illuminated interior and over-chimney mirror, the heat actually emanates from the imitation coal. The base is made from real firebrick; and cigarette ends, paper or matches inadvertently thrown into the fire, are consumed. One, two or three elements can be put in circuit or the special flame lamp only. Portable fires finished in anodized colours, and inset radiators in marble and tile suites are also shown. The company's coal-electric system is demonstrated by a coal fire suite with an electric interior moved in and out by an electric motor.

Bratt Colbran " Sunrise " fire

George Bray & Co., Ltd. (C 412).—A sectioned cylinder shows how immersion heaters and circulators should be fitted. There is also a small air heater battery for fitting in duct work for electrically heated ventilation systems. Samples of " Chromalox " and " Tubalox " type immersion heaters, strip and ring and sheathed wire type elements (the latter bent into various forms) accompany kettle elements, refractory insulators for cookers, immersion heaters and other domestic electrical equipment; also low-loss steatite parts for radio frequency.

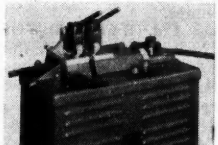
Brentford Transformers, Ltd. (D 226).—A " Breco " voltage regulator.

British Aluminium Co., Ltd. (D 605).—Aluminium and its alloys in standard wrought forms; searchlight mirrors treated with "Brytal."

British Electrical Development Association (C 509/408).—In co-operation with the Midlands Electricity Board the principal theme of the E.D.A. exhibit is " Electricity Speeds Production." Dioramas indicate electrical aids in the fields of testing, production and research.

British Emulsifiers, Ltd. (A 524).—" Beta " electric fires and " Betaware " aluminium hollow-ware.

British Insulated Callender's Cables, Ltd. (C 318 & C 413 316).—Resistance welders include the general-purpose pedal-operated spot welder No. 94 (20 kVA) for welding mild steel up to $\frac{3}{8}$ in. (9·5 mm) added thickness or aluminium up to $\frac{1}{16}$ in. (1·59 mm) added thickness, a continuous spot welder and the model 109 bench-type flash welder (illus.) specially suited for welding steel strip such as bandsaws. The new two-meter arrangement of the consumer's service unit, rising main distribution boxes, a floor-mounting fuse distribution box, and a straight joint for a 3-core 33-kV screened type cable are also shown, together with runs of " Sandwich " type cables demonstrating their



No. 109 bench-type flash welder (B.I. Callender's Cables)

non-bleeding qualities for industrial use where high ambient temperatures and vertical runs are encountered. There are working models of railway electrification schemes and trolleybus overhead equipment, with crane and current collector equipment. The latest high-frequency heaters, welders and soldering machines complete the display.

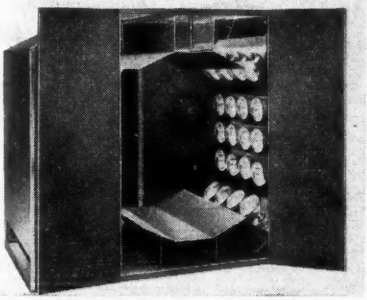
British Jeffrey-Diamond, Ltd. (D 526).—A swing hammer pulverizer, a "Flextooth" crusher and an "Atomill" fine grinder.

British Made Electrics, Ltd. (C 203).—See Hotric, Ltd.

British National Electrics, Ltd. (C 322).—Domestic electrical appliances include standard and breakfast cookers, "Charlton Twin" dual-purpose water heating systems, pressure and non-pressure type water heaters and "J.P." space-heating apparatus. A new two-tone ivory flush-to-floor type cooker is shown for the first time.

British Non-Ferrous Metals Federation (D 219).—Advice on all matters relating to the non-ferrous metals industry is given on this stand.

British Thomson-Houston Co., Ltd. (C 511/410).—An air-insulated vertical plugging, oil-break switchgear equipment for up to 150 MVA at 11 kV incorporates a single-break oil circuit-breaker with self-compensated arc control chambers. The new "Class BP 31" flameproof switchgear; a 400-A, 600-V glass bulb rectifier equipment; contactor equipment rated at 60 A at 6·6 kV, for the control of the stator circuits of induction motors driving mine hoists, boiler house fans, pulverizing mills, conveyors, etc.; direct-on motor starters, with industrial and flameproof enclosures; an electric timer; and a safety lighting set, giving 50 V from a 400 440-V supply are other power and industrial items. Motors include a variable speed a.c. commutator type; a flameproof mining motor; small industrial units with die-cast frames; various fractional h.p. and "built-in" stator and model units for machine tools; also suds pumps. There are also displays of typical "Fabroil" silent pinions; "Pyrobar" industrial heaters, magnetos, a portable oil test set, and the "Forrest" insulation test set. New 1-kW high-frequency heaters are designed primarily for preheating moulding powder. The size of the welder control equipment is reduced, largely by arranging for all the timing circuits to be built-in. There are also an electronic voltage regulator; an electronic timer; a P.E. relay; a 16-mm sound-film projector and a new 35-mm cinema projector. Among the most important lighting exhibits are "Mazdalux" fluorescent mine-lighting fittings, the corrosion-resisting industrial fitting "F809," fluorescent street-lighting lanterns and special "Mazda" lamps. The new "Mazda" 250-W infra-red lamp (illus.) for industrial use has a parabolic bulb and satin frosted crown. An entirely new arrangement is the coating of the lower half of the bulb inside with aluminium, obviating the need for any external reflector and ensuring the maximum concentration of radiant energy.



New "Mazda" infra-red oven

British Trane Co., Ltd. (B 324).—Electric "Vectair" convection heaters are supplied for floor or wall fixing, or for concealment in walls, etc. "Univectairs," "Projectaires" and "Torridaires" for heating factories, all incorporate electric motors and fans: "Univectairs" can be supplied with electric heating elements.

British Vacuum Cleaner & Engineering Co., Ltd. (A 520 & D 203 102).—On stand A 520 is a selection of "Goblin" vacuum cleaners, heat-controlled irons, "Time-Spot" radio, clocks and "Teasmade" apparatus. Stand D 203 102 contains pneumatic boiler flue dust removal plant, central vacuum cleaner installations, portable industrial vacuum cleaners and improved pneumatic sack cleaning equipment. There is a new interceptor for handling liquids in conjunction with a vacuum cleaner.

Brook Motors, Ltd. (C 210).—This year the company is concentrating on its "Cub" fractional-h.p. motors, which are available in single, two- and three-phase, capacitor, protected and totally-enclosed types from ¼ to ¾ h.p. The latest addition to the range has resilient mounting (illus.). A sound film of the Fractional-H.P. Motor Department is presented.

Brook "Cub" fractional-h.p. motor with resilient mounting

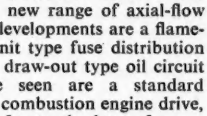
J. Broughton (D 610).—A complete range of industrial safeguards,includes new types of press guards, clothing, welding masks and goggles.

Browett-Lindley, Ltd. (D 604).—"Browett-Coborn" petrol and petrol paraffin engines are suitable for driving generators, etc.

David Brown & Sons (Huddersfield), Ltd. (D 138).—A comprehensive collection of gears includes "Radicon" worm reducers for small and fractional horse power motors.

Brown's Clipper Co. (1939), Ltd. (D 713).—Electric hair clippers for saloon and home use.

Brush Electrical Engineering Co., Ltd. (C 709/608).—Special attention is drawn to the first of the company's new range of axial-flow turbines. Other new developments are a flameproof motor (illus.), unit type fuse distribution gear and an industrial draw-out type oil circuit breaker. Also to be seen are a standard alternator, for internal combustion engine drive, the core and windings of a standard transformer, a group of induction motors, oil circuit breakers, knife switches, current transformersand a scale model of the recently completed prototype 400 b.h.p. diesel-electric locomotive.



Brush flameproof motor

Bulpitt & Sons, Ltd. (A 417 & C 506).—The new "Royal" kettle and the "No. 475" coffee percolator are among a general display of "Swan Brand" domestic electrical appliances, which include kettles, percolators, irons, urns, fires and ground-base aluminium hollow-ware.

Buncher & Haseler, Ltd. (A 630).—Electric kettles, coffee percolators, fires, heat-controlled irons and ground-base utensils.

Burco, Ltd. (C 312).—In addition to the "600" washboiler intended for hire and housing schemes there is a special type supplied for temporary housing. Both the "E840" square cabinet model and the "E650" round de-luxe boiler are available in a range of pastel shades. The new "217" electrically-heated, hand-operated cabinet type washing machine and a porringer boiler can also be seen.

Burton Holt (Chelsea), Ltd. (A 305).—Electric table lamps.

B.V.C. Industrial Constructions, Ltd. (D 203/102).—See British Vacuum Cleaner & Engineering Co., Ltd.

Cable Makers' Association (C 413/316).—A symbolic representation of a telescoped sample of cable forming an office is surrounded by a display of exhibits, with seating accommodation for small conferences. There are display apertures in the walls and a model cable drum has the letters "C.M.A." on the panoply.

Cable & Wireless, Ltd. (C 223).—This stand is designed to illustrate the principal services of the British overseas telegraph system.

Calorizing Corporation of Great Britain, Ltd. (D 407/306).—See Babcock & Wilcox, Ltd.

Campbell Engineering Co., Ltd. (A 326).—Immersion heaters are among products.

W. Canning & Co., Ltd. (D 207/106).—Electroplating and metal finishing equipment appearing for the first time are a totally immersed plating barrel made of "Perspex" for dealing with small articles in bulk, a new totally enclosed back washing filter press, improved octagonal type "Maxim," "Major," and "Minor" plating barrels, a backstand idler, a polishing machine, and streamlined motor polishing lathes. Other exhibits include motor generators and rectifiers, and a new type of "Meteor" resistance board.

Capon Heaton & Co., Ltd. (D 710).—Mechanical moulding, extrusions and bondings for the electrical industry.

C.A.V., Ltd. (C 501).—Electric starters, dynamos and control gear, lead-acid and "Nife" batteries, and vehicle lamps. Fluorescent lighting of passenger vehicles is also demonstrated.

Chance Brothers, Ltd. (C 604).—Marine lighting equipment, switchgear and submersible pumps.

Channel Conduits, Ltd. (B 300).—See Richard Crittall & Co., Ltd.

Chloride Electrical Storage Co., Ltd. (C 417).—With "Keepalite" emergency lighting equipment is "Exide" and Chloride equipment for switch-tripping and supervisory control in sub-stations, telephone exchanges, farm and country house lighting. Other batteries shown include traction, diesel engine, car, aircraft, marine, railway, radio and hearing-aid types.

Christy & Norris, Ltd. (D 403).—The "Briton," "Yeoman" and "Essex" grinders, pulverizers, disintegrators, and laboratory mills.

Clang, Ltd. (C 207).—Ceiling roses have a new method of attaching the cover to facilitate wiring, "Multi-plugs," 2- and 3-pin flush and surface sockets and conduit bushes make their first appearance. Plugs, connectors, etc., specially manufactured to Continental standards are being displayed; also an angle entry iron connector. The Clang light-saving switch is demonstrated.

Clarkson Thimble Tube Boiler Co., Ltd. (D 407/306).—See Babcock & Wilcox, Ltd.

COA Products (B 618).—The "Dimplex" oil-filled electric convector radiator.

George Cohen, Sons & Co., Ltd. (D 604).—Power presses, punching, shearing, cropping and notching machines, guillotines, cranes, etc.

E. K. Cole, Ltd. (C 310).—Particularly interesting among "Thermovent" heaters are models for installation aboard ship. New Ekco-Ensign fluorescent lamps and fittings are shown.

Coleman & Appleby, Ltd. (D 211).—"Canda" electro-plating plant includes semi-automatic equipment. Rectifiers, anodes and polishing plant are on view.

J. Collis & Sons, Ltd. (D 522).—Prominent on this stand is a rapidly assembled and dismantled installation combining the Collis "MotaVeyor" powered belt conveyor of unit construction and the "RolaVeyor" gravity roller conveyor. A 5-cwt electric-hydraulic stacker is demonstrated.

Connollys (Blackley), Ltd. (C 413/316).—Instrument wires and electric cables.

Constructors, Ltd. (D 401/300).—Steel shelves and racks, stillages and truck platforms, partitioning and slotted steel sections.

Co-operative Wholesale Society, Ltd. (B 711 & B 620).—Fluorescent lighting fittings, fires, irons, kettles, washers, and vacuum cleaners.

Copper Development Association (D 230).—A replica of the main bus-bar of the G.P.O. International Telephone Exchange exemplifies the applications of copper to electrical engineering. Copper strip wound on edge illustrates some of the advantages of copper and its alloys for the winding and current-carrying parts of electrical machinery.

Counting Instruments, Ltd. (D 111).—Electromagnetic counters are used for indicating on a remotely situated panel. Special assemblies are made for electricity meters.

Craigpark Electric Cable Co., Ltd. (C. 413/316).—Electric cables and accessories.

Critchley Brothers, Ltd. (A 318).—Electric cable ferrules and phase buttons.

Richard Crittall & Co., Ltd. (B 300).—Five revolving dioramas illustrate heating services, air conditioning and ventilation, factory radiant warming, industrial plant and equipment and drying plant, while five stationary dioramas depict the "Dulrae" and "Medrae" electric radiant warming systems, research and development, the "Channel Conduit" system of electrical wiring, air filtration and electrical installations. There are working models of bottle and can washing machinery, a chemical dryer and an automatic pottery plant. Electric kitchen and catering equipment is represented by roasting ovens and the recently-introduced "Combriex" combined mixing, slicing, chopping and mincing machine, and the "Turmix" emulsifier and homogenizer.

Crompton Parkinson, Ltd. (A 327/226, B 308a & C 413/316).—On the Derby Corporation stand (A 327 & 226) are products of the company's factory at Derby—p.i. cable for up to 22 kV, v.i.r., varnished cambric, and welding cables and flexible cords. On stand B 308a can be seen tungsten and fluorescent lamps; lighting fittings; rubber and p.i. cables; "Young" starter and traction batteries; measuring instruments; house service meters; motors; and switchgear. The company is also represented in the C.M.A. exhibit.

B. Cruickshank, Ltd. (D 226).—Besides rectifiers, semi-automatic chrome bath and automatic chrome barrel, polishing and grinding machines, "Matafilter Unit" and filter press, centrifuge plating and burnishing barrels, a special feature is made of fluoborate solutions for depositing zinc, tin, lead and tin-lead alloys, particularly on wire and strip. A "Breco" voltage regulator made by Brentford Transformers, Ltd., is also included in the display.

C.S.A. Industries, Ltd. (B 313).—"Castle" brand aluminium ware.

Cunliffe-Owen Aircraft, Ltd. (B 618).—The "Dimplex" oil-filled electric convector radiator.

Cyc-Arc, Ltd. (C 110).—Electric arc stud-welding equipment includes two types of hand tool equally efficient for down hand, vertical and overhead operation, together with types "A" and "B" equipment, consisting of a controller with an automatic timing unit to regulate the period of fusing according to the diameter of the stud. A new bench mounting stud welding tool has a jig for the high-speed production of repetition work.

T. H. & J. Daniels, Ltd. (D 216).—Besides a 150-ton hydraulic press for plastics and a preforming machine there is the new Edgwick "Hy" injection moulding machine.

Edwin Danks & Co. (Oldbury), Ltd. (D 407/306).—See Babcock & Wilcox, Ltd.

John Davis & Son (Derby), Ltd. (A 327/226).—The new "Davisavebelt" sequence control for conveyors, has been designed primarily for use in mines. Besides giving fully automatic sequence starting and stopping, it affords protection to the belt in case of breakage or undue slip. The M.L. pneumatic electric "Dafluor" fluorescent mine lamp consists of a self-contained compressed air-driven turbo-alternator mounted on a lantern containing twin 18-in. (45 cm.) 15-W fluorescent tubes. A new 4-in. (10 cm.) anemometer gives readings in feet or metres.

Davis & Timmins, Ltd. (C 114).—Screws, nuts, washers, studding, terminals, cable sockets and connectors, conduit bushes, brass automatic screw machine repetition parts as used in the electrical trades, together with inserts for plastics, presswork, etc.

Delapena & Son, Ltd. (D 234).—Precision machine tools include radio-frequency induction and dielectric heating apparatus, internal and external honing equipment, cylinder gauges and high and low pressure lubricators and sprayers. Of special interest to the plastics and allied industries is the 2-kW "Deltron" D-10 dielectric heater.

G. P. Dennis, Ltd. (C 718).—Ironclad fuse and switchgear up to 300 A cover distribution fuseboards (ironclad and hard wood cased) metal-clad switchfuses and switch splitters with h.r.c. and rewireable fuses. A typical substation l.v. distribution switchboard incorporates a new tail type feeder unit. Cooker control units, wash-boiler control units and a new type of consumers' control unit (illus.) are also shown.

Consumer's control unit for small dwellings (G. P. Dennis)

Derby Cables, Ltd. (A 327/226).—Cables.

Derby for Industry (A 327/226).—Local products represented include motors and cables.

Desoutter Bros., Ltd. (C 415).—A new range of fourteen electric drill guns and screw guns include $\frac{1}{4}$ in. and $\frac{5}{16}$ in. capacity drill guns with speeds from 450 to 5,000 r.p.m., and

screw guns and nutrunners with capacities up to No. 12 wood screws or $\frac{5}{16}$ in. nuts. Three models of corner drills, and two telescopic jig drills are also available. Housed in a pressure die-cast aluminium body, the motors in all models have 10 per cent more power for the same current consumption than the existing range.

Diamond Motors (Wolverhampton), Ltd. (C 227).—The "Graiseley" pedestrian-controlled electric vehicle.

R. & J. Dick, Ltd. (D 221).—Driving belts include the "Ruberix" type woven from filastic yarn and vulcanized, and the "Dixel" V type or heavy drives.

R. G. Dixon & Co.,Ltd. (C 726).—A full range of machines is available for floor scrubbing and polishing and carpet shampooing. The "Columbus" vacuum cleaner can be quickly converted to a floor polisher. A wax-spraying machine is electrically heated.

Dixon carpet shampooing machine

Dorman & Smith, Ltd. (C 108).—A section panel of the new cubicle type switchboard for the House of Lords incorporates a Dorman XL 800-A triple pole air-break circuit-breaker with hinged-type isolating contacts, and under-voltage release. Amongst other exhibits are a section panel of the new switchboard for the House of Commons, with back of board switches, a new fused test prod (illus.), prismatic and bulkhead lighting fittings, distribution boards, switches and switch fuses, and consumer units. D.S. Plugs, Ltd., show the "D.S." fused plug and socket, and other accessories. Moving exhibits demonstrate the strength of "Alorite" fuse ceramic, and a life test on a switched socket.

Dorman & Smith test prod incorporating the DS fused pin

S. J. Downham & Co., Ltd. (B 505).—Electrical toilet cabinets.

D.P. Battery Co., Ltd. (C 711).—Batteries for lighting plants, power stations and telephone exchanges are available from 10 to 73,000 Ah capacity. Of particular interest among a display of "Kathanode" batteries for electric trucks, delivery vans, locomotives, ships and submarines, is a 6-cell unit of one of the 120-V, 236-Ah batteries for starting the 16-cyclinder 1,600-h.p. English Electric diesel engine for the British Railways main line locomotives.

D.S. Plugs, Ltd. (C 108).—See Dorman & Smith, Ltd.

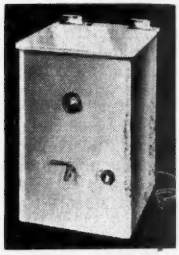
Dulrae Manufacturing Co., Ltd. (B 300).—See Richard Crittall & Co., Ltd.

Dunlop Rubber Co., Ltd. (D 519).—Mechanical rubber goods, conveyor and V belts, vacuum-cleaner hose, vulcanite, switchboard matting, etc.

Dunlop Special Products, Ltd. (D 220).—Anti-vibration mountings, transmission couplings and clutches, etc.

Duralite, Ltd. (C 403).—Fluorescent lamps in white, daylight, warm white and other colours.

A. J. Eadon & Co., Ltd. (A 632).—The "Vega" electric washing machine (illus.) is electrically heated by means of 2¼-kW elements with three-heat switching. The monel metal drum containing the clothes is revolved vertically by a ¼-h.p. motor.



"Vega" washing machine (A. J. Eadon & Co.)

Edison Swan Electric Co., Ltd. (C 413/316).—Electric cables and accessories.

Ekco-Ensign Electric, Ltd. (C 310).—See E. K. Cole, Ltd.

Electric Construction Co., Ltd. (C 708).—An example of the "Vari-speed" drive from a.c. is similar to a large number supplied up to 350 b.h.p. A 3-phase slipring induction motor of screen-protected type can also be made as drip-proof, pipe ventilated or totally enclosed types. Ammeters and voltmeters for mounting on switchboards or starting switches, a car battery charger, a 12-phase glass bulb for a mercury arc rectifier, short-circuited rotor type induction motors, starters and switches are also shown.

Electric Furnace Co., Ltd., and Electric Resistance Furnace Co., Ltd. (C 611).—A high-frequency induction melting furnace body is on show, together with illustrations of working plants. The newest applications of high-frequency induction heating for heating for forging, brazing and soldering and heat treatment are also covered.

Electrical Review (C 614).—Representatives are available to advise on all matters relating to the electrical industry.

Electro-Hydraulics, Ltd. (D 717/616).—Battery-driven fork lift trucks and electro-hydraulic valves.

Electrolux, Ltd. (C 734).—In addition to the "Z 30" vacuum cleaner there is the new "L.K.300" absorption type refrigerator (illus.) specially built for export. It has a storage

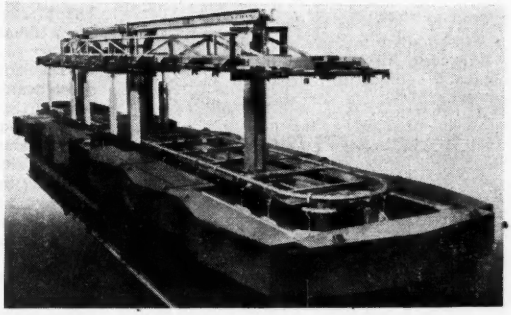
Electrolux LK 300 refrigerator specially designed for export

capacity of 3 cu ft and a shelf area of 5·8 sq ft.

Electromagnets, Ltd. (C 605).—Electro - magnetic equipments comprise lifting magnets, magnetic separators, clutches, chucks and hold-down welding magnets for various industries.

Electro-Chemical Engineering Co., Ltd. (C 611).—A fully automatic Efco-Udylite plating machine (illus.) demonstrates the method of transfer of a typical return type machine. The machine has six process tanks and will handle up to seventy-four 12 in. by 21 in. racks per hour.

Efco " Udylite " plating plant



Electro Methods, Ltd. (C 730).—Among applications of magnetic amplifiers are horse-power recording, light impulse transmission and storage, colour comparison and similar photometric tests, and temperature control. " Mess" motors, an automatic water still, process timers, thermometers, relays, mercury switches, precision wound resistances, flexible heaters, heavy-duty relays, earth-protection equipment and continuity testers are other products.

Elfson, Ltd. (A 609).—Novelties are a combined wringer cabinet, electric dryer and airer; and a combined electric fire, fire screen and occasional table.

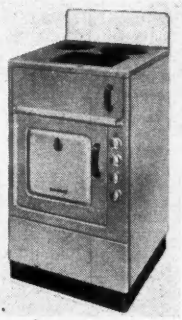
Elliott Brothers (London), Ltd. (D 114).—A CO_2 panel is made specially for fruit farms to give gas content in storage chambers, while an electrical resistance thermometer equipment is available for use on meat and fruit vessels. A new inked thread recorder, portable temperature and CO_2 indicators, portable radiation and disappearing filament optical pyrometers and a humidity meter transmitter are also displayed, together with various electrical measuring instruments, including recorders, a Petch Elliott current transformer test set, an Elliott-Shotter frequency indicator, " Weameter," and " Century " test sets, a new moving-coil miniature relay, and the Elliott-Shotter water level transmitter.

E.M.B. Co., Ltd. (D 134).—Besides presses, injection moulding and diecasting machines, there are a contactor type rotor starter, a 75-A contactor, a drum type controller and resistances.

E.M.I. Factories, Ltd. (C 516).—Model DH 35A high-frequency dielectric heater, which heats 22 lb of moulding powder to 120 deg C per minute, is the smallest of several types shown. Demonstrations are also given of radio-frequency induction heaters utilized for hardening small components and for soldering 10-15 gross of ferrules per hour. Portable and tape recorders and marine radar equipments are also represented.

Enfield Cables, Ltd. (C 413/316).—Electric cables and accessories.

English Electric Co., Ltd. (C 613/512).—New cookers in green and cream enamel, incorporate simmer control of the boiling plates as standard, as well as thermostatic oven control. The action of a 6·6-cu ft refrigerator (also seen for the first time) is shown by a demonstration panel. Other domestic appliances displayed are a plate-warmer made of armour-plate-glass, the " Ritemp " washing machine, a 1½-gal. over-sink water heater (for export only) and a hot water circulator. A cut-away section of an 11-kV air-blast switch shows the method of operation and there is a full range of fuses and fuse fittings, including cartridge fuses with a rupturing capacity of 100 MVA at 11 kV. The range of fractional-h.p. motors has recently been completely redesigned and light weight and small size has been achieved by the use of alloy castings. Meters, testing instruments and a stud-welding unit are also shown.

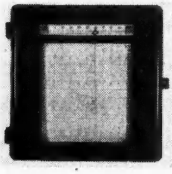


English Electric cooker finished in green and cream enamel

Eralite Manufacturing Co., Ltd. (C 304).—The new portable " Miniflector " combined convector and radiator with glass front is a

smaller model of the "Conflector." Another new item is the "Dormez" lighting fitting with transparent hood. The "Chaudeau" kettle and "Cuisiniere" table cooker are also shown.

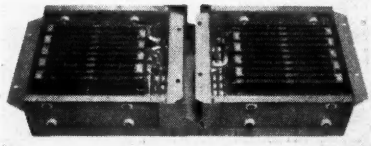
Ether, Ltd. (C 700).—The new "Wide-



Ether "wide-strip" electronic potentiometer recorder

Strip" electronically operated potentiometer (illus.) besides indicating and recording, provides on-off, high-low, multi-position and proportional control. It can be calibrated to measure temperature, millivolts, milliamps, CO_2 gas flow, etc. Electronically operated Ether-Wheelco "Capacitrol" and "Flameotrols" are also shown, together with a new model of the "Indicorder" continuous chart recording and controlling pyrometer, a molten metal pyrometer, portable testing instruments, and edgewise pattern temperature indicators.

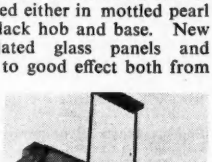
Expanded Metal Co., Ltd. (C 617).—Unbreakable non-rusting expanded metal resistances are suitable for traction and a wide



Trolley-bus main starting and braking resistance (Expanded Metal Co.)

range of industrial applications. Electric heater units are made for such applications as convectors and plenum systems.

Falk, Stadelmann & Co., Ltd. (C 208).—The "Raydex" R 647 cooker and breakfast cooker is now available finished either in mottled pearl grey or cream, with black hob and base. New plastic materials, plated glass panels and louvres are employed to good effect both from the point of view of appearance and efficiency in a range of fluorescent lighting fittings (illus.).



Falk, Stadelmann "Avon" fluorescent lighting fitting

Ferguson, Pailin, Ltd. (C 622).—This exhibit comprises 33-kV, 11-kV and l.v. switchgear, control boards, control switches, semaphore indicators and fuses.

Ferranti, Ltd. (C 615/514).—Among a.c. and d.c. house service and switchboard meters, prepayment meters, maximum demand meters, two-rate meters and meter testing equipment are the "Fly" and "Flx" polyphase meters and a compact new d.c. credit or quarterly meter, type "Fk," available with dials or cyclometer. New instruments include a pocket light tester, the "FM" instantaneous relay, a maximum demand alarm relay, and a new hysteresis synchronous motor. A sectioned model of the 150-V electrostatic voltmeter shows the construction of the movement. A new 6-in. rectangular flush pattern instrument is adaptable for projecting mounting. Hermetically sealed tropical instruments are demonstrated operating continuously in hot water. A new use of the high-voltage indicator for "phasing out" is also demonstrated, together with summation metering equipment. Items specially displayed by the Transformer Department are rotary type on-load tap changing gear, the latest high speed cathode-ray oscillograph for h.v. research purposes, moving-coil regulators, power factory condensers, and laminated synthetic resin powder paper tubes and cylinders. The Electronics Department shows neon and argon filled lamps, cold cathode relay tubes, mercury vapour h.v. rectifiers and glass to-metal seals. Panel fires with decorative screens, space heaters for schools and water heaters are some of the domestic appliances displayed. New electric clocks include an automatic alarm with 24-hour alarm setting and automatic re-set. The Ferranti-Jeans seed conditioner dries all types of seed whilst still in the sack.

Fescol, Ltd. (D 742).—One-eighth size models illustrate applications of the "Fescol" process of electrodeposition of nickel, chromium and copper on component parts of machinery for the purpose of compensating for wear, resisting corrosion, providing a non-toxic surface, etc.

Finney Presses, Ltd. (D 140).—A 50-ton dual transfer press, a pneumatic pelleting machine and a 10-ton laboratory press are of entirely new design. Electric hotplates, heating equipment, pumps and control gear are also on view.

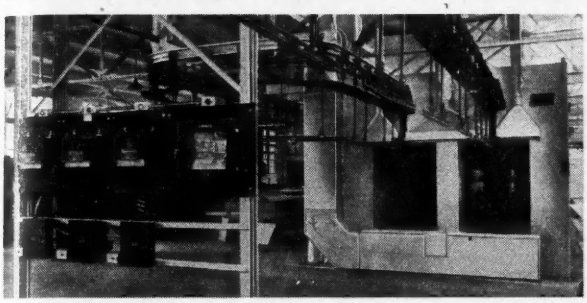
Firth-Vickers Stainless Steels, Ltd. (D 419/320).—Firth-Vickers, stainless "Staybrite," and heat-resisting steels in bars, sheet, plate, strip, castings and forgings.

H. Fisher (Oldham), Ltd. (C 706).—An attractive new streamlined washing machine incorporates the latest developments in efficiency and safety devices. Sliding legs fitted to the lifting door at the rear of the cabinet form a stand for a receptacle to collect the clothes after wringing. In addition to the existing range of electric water heaters and immersion heaters 20- and 30-gal. cistern type storage heaters are shown, suitable for tropical climates. A new water heater thermostat of the stem type is non-magnetic with quick make and break action; a large gap prevents arcing.

Fisher & Ludlow, Ltd. (D 303/202).—The Bendix home laundry and "Ocean" radiators are to be seen on this stand.

Ferro Enamels, Ltd. (B 515).—The 600-kW "U" type continuous vitreous enamelling

furnace (illus.) is used for domestic cooker parts. The elements are individually automatically controlled to give the required fusing temperature of 800-900 deg C. Articles finished



"U" type continuous vitreous enamelling furnace (Ferro Enamels)

in the company's enamel and processed by its equipment are also shown.

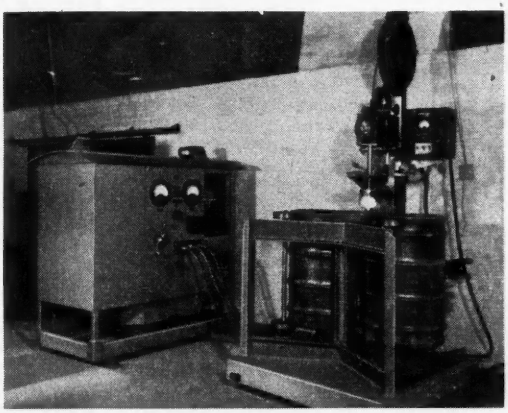
Flextol Engineering Co., Ltd. (C 231).—Among flexible shaft equipment for cutting, grinding, sanding polishing, screwdriving and nut-setting is a new equipment specially designed for glass grinding and polishing. A further new reciprocating sander is interchangeable with the company's cellulose levelling and polishing handpiece, while for the stone and building industry there is a high-speed drilling attachment. A new type of flexible shaft designed for arduous duties has the outer casing of armoured braiding instead of the normal rubber covering or flexible metallic tubing.

Foster, Yates & Thom, Ltd. (D 504).—Dry powder mixers are supplied for mixing fine clays, etc., used in the manufacture of porcelain insulators. Electrically-operated plywood and veneering presses are other products.

John Fowler (Leeds), Ltd. (C 329/228).— Diesel-electric locomotives.

W. T. French & Son, Ltd. (A 433).—Electric kettles, fires, irons, toasters, boiling rings and soldering irons.

Fusarc, Ltd. (C 705).—Three main types of equipment are represented—a stationary welding head, a tractor welding head and an automatic deck welder.



Fusarc apparatus being employed for welding barrel ends

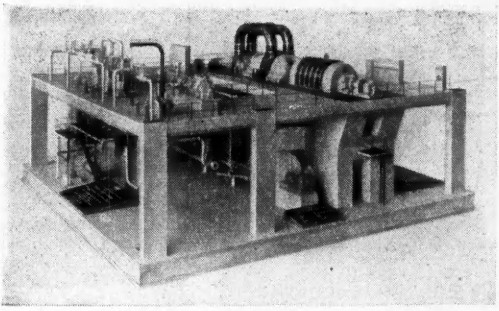
Gascoignes (Reading), Ltd. (D 715/614).—A two-point electric "auto-recorder" milking machine is fitted with the new vacuum cooler.

General Accessories Co., Ltd. (C 106).—Among a full range of "Clix" and "Genacco" electrical accessories special attention is drawn to the "Surrey" micro-break switch, the new "Surrey" 5-A and 15-A micro-break switch socket outlet and the "Clix" foot-press socket outlet.

Gent & Co., Ltd. (D 407).—Electric bells, luminous call and staff-locator system, controlled electric clock systems, electric movements designed for large tower and turret clocks, watchmen's tell-tale clocks and floatless liquid-level control equipment can all be seen in operation. There are also process timers, synchronous electric clocks, fire and burglar alarm equipment, telephones, indicators, mine signalling equipment, liquid-level indicating and recording equipment and electro-motor sirens.

General Electric Co., Ltd. (C 503/402).—In the centre of this stand is an illuminated pictorial display of the variety of world markets supplied under the G.E.C.'s export programme. Around this are sections containing aeronautical, process heating, street lighting, radio, household appliances, and lighting equipment. There is also a selection of electronic testing instruments, together with models of larger engineering products. Of special interest are the new air circulation ovens for heating frozen foods; the single-channel v.h.f. airborne transmitter/receiver; the radio compass; an airport lighting panel; aerodrome lighting equipment; a 1-kW high-frequency generator for soldering, etc.; a new infra-red lamp plant for softening

thermoplastic sheet; a miniature coloured plastic cabinet a.c./d.c. mains radio set primarily

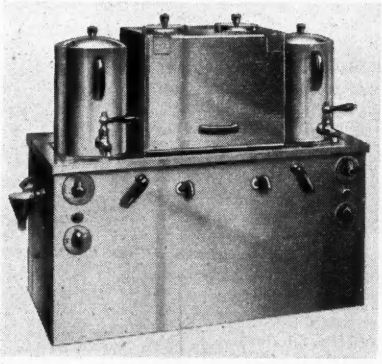


Model of a G.E.C. 30-MW turbo-generator installed at the Meaford power station

intended for Far Eastern markets and the latest all-mains receiver with "bandspread" tuning; a communications receiver and a 20-W mobile v.h.f. transmitter/receiver as used by police forces; a new layer-built flat electrode battery, suitable for deaf-aid appliances, and midget radio sets; four-lamp fluorescent street lanterns; one of the latest refrigerators and a new cleaner; telecommunication equipment; a moisture-in-timber meter and a magnetic sorting bridge; and a 150-A arc lamp incorporating two negative carbons.

Edward Gill (A 648).—Presswork in all metals for the electrical and allied trades.

Gillott Electro-Steam Cookers, Ltd. (A 318).—The final production model of the company's electro-steam cooker (illus.) can be seen, together with a utility model specially designed



Gillott electro-steam cooker

for housing schemes. Double stream boilers are also now in production.

F. Gilman (B.S.T.), Ltd. (D 506).—Three- and four-speed flexible drive machines for grinding, wire brushing, polishing, etc.; also rotary files, milling cutters and boiler scaling machines.

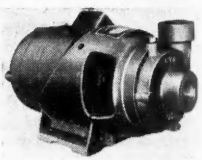
Gittings & Hills, Ltd. (B 322).—A variety of articles coated with industrial finishes, which include "Rockhard" synthetic stoving enamels.

Glostics, Ltd. (D 500).—"Gloscoat" hot-dip protective plastic coatings for packaging and preservation in transit and store.

W. T. Glover & Co., Ltd. (C413/316).—Electric cables and accessories.

E. Green & Son, Ltd. (B 504).—For the higher working pressures now used in the boilers of modern power stations the "Premier Diamond" horizontal economizer has been introduced.

Girdlestone Pumps, Ltd. (D 333).—Combined pump and motor units are intended particularly for industrial applications. The latest models of the Girdlestone patent glandless diaphragm pumps and industrial ball bearing centrifugal pumps are on view. The company also manufactures float switches.



Girdlestone motor pump

Greengate & Irwell Rubber Co., Ltd. (C 413/316).—Electric cables and accessories.

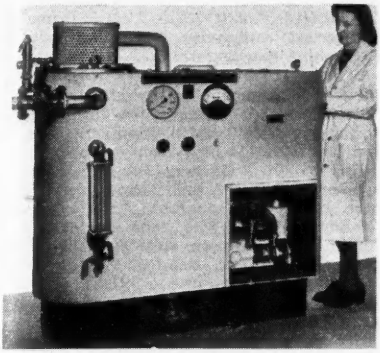
Grierson, Ltd. (B 300).—This company undertakes complete electrical installations for all types of buildings.

Grimsley & Co. (Leicester), Ltd. (D 103a).—An industrial electric boiler for generating steam.

Guest, Keen & Nettlefolds, Ltd. (B 627/526).—Films deal with products exhibited which include screws, bolts and nuts, rivets, bars, angles and channels, strip, nails, castings and forgings, telegraph ironwork and hand tools.

Guests Brass Stamping Co. (D 732).—Hot pressings in brass, copper and manganese bronze include electrical fittings.

G.W.B. Electric Furnaces, Ltd. (C 321/220).—Photographs of normal heat-treatment equipment too large to exhibit cover continuous type furnaces, mesh belt conveyors, pushers, chain conveyors, bell type furnaces, billet heaters and many others. A standard town's gas plant for producing protective atmospheres for bright annealing, brazing, etc., and samples of "Eternite" case-hardening compound, Shell-Wild-Barfield quenching oil and other hardening shop requisites are shown. Working exhibits include a 70-kW "Autolec" electrode boiler (illus.) capable of raising 230 lb of steam per hour, demonstrations showing how rapidly steam can be produced.



G.W.B. Electric Furnaces "Autolec" steam raiser

Hague & McKenzie, Ltd. (C 502).—"Pyramid" aluminium ware, specially constructed for hot-plate cooking, is all solid drawn through steel dies. Heavy-duty cooking vessels have specially welded galvanized handles and strengthened sides.

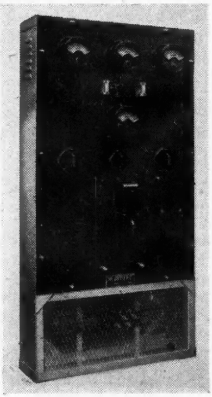
Hailwood & Ackroyd, Ltd. (C 602).—Both the metalwork and glassware of a new range of decorative lighting fittings are made entirely in the company's works. Lighting fittings and glassware suitable for schools, hospitals and other public buildings are represented.

Hancock & Co. (Engineers), Ltd. (D739/638).—Oxygen cutting and profiling machines.

Harvey Frost & Co., Ltd. (D 405/304).—Electric vulcanizers are available for joining electric cables, conveyor belts, etc. The "HF" process provides a satisfactory means of joining the earth screen on trailing cables as well as connecting with adequate separation the cores and finishing with a final overall diameter covering of t.r.s. to meet B.S.I. requirements.

G. A. Harvey & Co. (London), Ltd. (B 329).—Perforated metal of all descriptions, sheet metal and steel platework of all kinds, and gilled tubes.

F. C. Heayberd & Co., Ltd. (C 610).—Transformers, battery chargers and rectifying equipment are made to meet the conditions of the countries where they are to be installed. One of the latest battery chargers is a portable type with drip-proof cover, illuminated panel and heavy charging rate suitable for vehicle battery charging.



Heayberd l.v. installation panel for use in school science laboratories

Rectifying equipment incorporating metal rectification is supplied for electro-plating, emergency lighting, machine tools, fire alarm systems, magnetic separators, and electro-medical purposes. Transformers include open, enclosed and oil-insulated types.

Hellerman Electric, Ltd. (C 217).—Component parts of the Hellermann binding system and "Helvin" plastic mouldings, etc.

W. T. Henley's Telegraph Works Co., Ltd. (C 413/316).—Electric cables and accessories.

Alfred Herbert, Ltd. (D 310 & D 319/216).—Injection moulding machines, hydraulic moulding presses, preforming, diecasting and extruding machines are among plastic moulding equipment seen on Stand 216. Stand 319 is devoted to diecasting machines of various types. Small tools and measuring equipment on Stand 310 include the Hilger production projector for the rapid checking of mass-produced components and instruments for measuring and testing for dimensional accuracy as fine as 0·000001 in.

Hi-Craft (Electrical) Products, Ltd. (C 403).—See Smart & Brown (Engineers), Ltd.

Higgs Motors, Ltd. (D 601).—A.c. and d.c. electric motors and generators are supplied up to 500 h.p. Fractional-h.p. units from ¼ h.p. include split-phase, capacitor-start and repulsion-induction motors for single-phase supplies; also machines for two- and three-phase and d.c. supplies. They are compact and are suitable for all types of light industrial, domestic and refrigerator duties. Two- and three-phase motors for all types of industrial drives are available in slipring and squirrel-cage, screen-protected and totally enclosed fan-cooled types. For machine tools flange-mounting units are built either with standard flanges and shafts or to suit customers' individual requirements; alternatively there are built-in stator-rotor units from ¼ h.p. to 25 h.p. A.c. variable-speed commutator motors are eminently suitable for printing, paper-making and hosiery machinery, etc. Polishing motors, propeller fans, small tools and hand dryers are also represented.

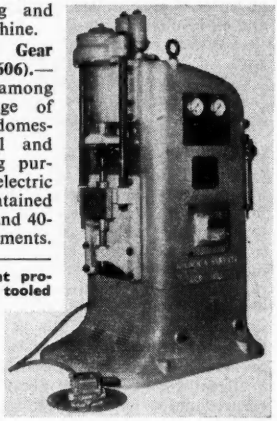
Hoover, Ltd. (C 714).—With fractional-h.p. motors is the newly introduced range of Hoover accessories, comprising plastic commutators, shaded-pole motors, toggle and slide switches. An electric washing machine soon to be introduced to the home and overseas markets can also be seen.

E. C. Hopkins, Ltd. (D 741).—Flexible-shaft machines from ¼ to 1½ h.p. capacity in multi and single speeds, base and overhead types are accompanied by tool post grinding attachments, right-angle drives, extension handpieces and attachments for steel shearing, screwdriving, sawing, filing and chiselling. A bench tool grinder, polishing machine and twist drill grinder are also displayed.

Holden & Hunt, Ltd. (C 719/618).—Eighteen types of electric resistance welding and heating machines include a rivet heating and upsetting machine (illus.), a 15/30-kVA light alloy foot-

operated spot-welder with an electronic timer, a chain welder, spot welders of the rocker arm and sliding head types, three sizes of auto butt wire welders and a tenon heating and upsetting machine.

Horstmann Gear Co., Ltd. (C 606).—Outstanding among a wide range of switches for domestic, industrial and street lighting purposes are the electric wind, maintained synchronous and 40-day run movements.



Holden & Hunt projection welder tooled up for rivet heating and upsetting

Hotpoint Electric Appliance Co., Ltd. (C513).—A range of industrial heaters constructed on the "Torribar" sheathed-wire principle is shown for the first time in a special display indicating typical applications. "Torribar" boiling plates are fitted with E.D.A. cradles for interchangeability and particular attention is called to an 8-in. dia. single-element plate for use with a simmering control device. In the home laundry section a portable electric clothes dryer accompanies a cabinet washing and wringing machine with bowl and cabinet in clear "Perspex," to show the action. Home and export vacuum cleaners and small appliances are also shown.

Hotric, Ltd. (C 203).—The new "2-in-1" immersion heater possesses high loading in short lengths. The incorporation of "Pyrex" glass inner containers in storage heaters of the 1½- and 3-gal. sizes containers is hygienic and eases servicing. The "Duplex" with two sets of thermostatically controlled elements supplies all the domestic hot-water needs of a family. An innovation is a cabinet with built-in 1½-gal. heater, cupboards each side, and a large mist-free mirror. Samples are also on view of peat which the company is now using as an insulating medium in preference to imported cork: it is claimed to be up to 25 per cent more efficient than granulated cork.

Charles Hufton & Sons, Ltd. (A 324).—Electric floor standards.

Hurley Machine Co. (England), Ltd. (C 612).—The "Thor Automagic" machine washes both clothes and dishes.

Hussmann British Refrigeration, Ltd. (A 633).—Refrigerated display cabinets including a model designed especially for the moderate sized retail grocery stores and another for the attractive display of frozen food, including ice cream.

Silas Hyde, Ltd. (C 723).—Electric enamelling, lacquering, core-drying and other industrial process low-temperature ovens.

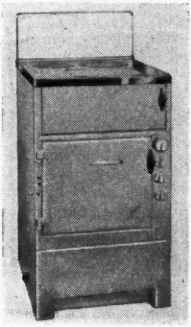
Victor H. Iddon, Ltd. (C 107).—Among "Nettle" shockproof electrical accessories a special feature is the new 13-A flush-mounting socket-outlet and fused plug primarily intended for ring-main circuits, and complying with B.S. 1363. A production 13-A plug and socket together with a 5-A a.c. micro-gap switch are seen undergoing endurance tests. The new "Limpet" clamp-type handlamp leaves the hands free. Also on view are lampholders, ceiling roses, bell transformers, plugs and sockets. bracket and ceiling fittings.

Imperial Chemical Industries, Ltd. (D 312, D 315/212 & D 409/308).—The importance of paint and its proper application to the export drive is the theme of the company's Paints Division display on Stand D 312. A new technique, a stoving finish for wood, is demonstrated. The Metals Division (Stand D 409) has evolved special methods for manufacturing tubes in the new copper-nickel-brass alloy. "Alumbro" (aluminium brass) tubes are particularly resistant to corrosion, and retain their strength to a marked degree even at temperatures of 400 deg C. A particularly interesting exhibit is the accelerated corrosion and erosion testing apparatus.

Impregnated Diamond Products, Ltd. (D 500).—Electrical control apparatus and resistors.

India Rubber, Gutta Percha & Telegraph Works Co., Ltd. (C 413/316 and D 615).—Ebonite sheet, rod, tube, mouldings, etc.; batteries and boxes.

International Combustion, Ltd. (A 327/226 & D 331/228 & 241).—A model of a tangentially fired pulverized fuel steam generator for a central power station incorporates an adjustable furnace with tilting burners and other special features. There is also a model of a Beaumont drag scraper plant for coal storage, together with examples of a "Hummer" electric screen, a "Vacseal" pump, a Raymond laboratory mill and a "Rovac" laboratory filter.



The 194 J cooker is available with all-white vitreous enamel finish for export

Invicta Electrodes, Ltd. (D 717/616).—Welding electrodes.

Ioco Co., Ltd. (D 701).—Electrical insulating materials, including black adhesive tape.

Jackson Electric Stove Co., Ltd. (C 411/314).—The "Cleanline" 190 series cookers (illus.) cater for any family from 2 to 10

people. For overseas markets two-tone ivory or all-white finishes are available. The "900" washboiler has an automatic cut-out and a re-set push-button. Among heavy-duty apparatus the double unit chef's range is constructed on the unit principle so that additional units can be added. Hot-cupboards have plain or specially fitted hob plates incorporating bains-marie, sauce pots, vegetable containers, and carving wells. Grills, pastry ovens, fish fryers, steaming ovens, etc., vegetable boiling pans, water urns, milk and coffee urns, "Twin Ring" boiling units (in cream for export) and electrically heated food trolleys are also represented.

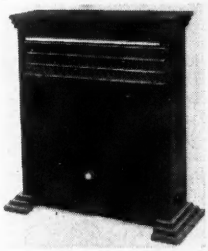
Jenson & Nicholson, Ltd. (B 200).—Industrial finishes include "Jensolac" stoving enamels, "Coilac" and "Lacwatt" insulating varnishes, and a new heat-resisting enamel.

Johnson, Matthey & Co., Ltd. (D 100).—Electrical contacts and contact materials are shown for equipment ranging from telephone relays, domestic switches and appliances to industrial control gear and heavy switchgear. Rhodium is extensively used as an electrodeposit to give as a contact, reflecting or corrosion resistant surface. The company specializes in superfine wires and precision drawn seamless tubes. Mallory resistance welding materials, dies and electrodes are further exhibits.

Johnson & Phillips, Ltd. (C 322 & 413/316).—The company's new aluminium-sheathed power cables are to be seen among cables and accessories, electrical engineering equipment, switchgear, transformers and capacitors.

Richard Johnson & Nephew, Ltd. (B 417/316).—Ferrous and non-ferrous wires, including transmission wires.

E. H. Jones (Machine Tools), Ltd. (D 612).—Sigma fine measuring instruments and multi-inspection plant are demonstrated.



Kayvec convector (Cyril Kieft & Co.)

Cyril Kieft & Co., Ltd. (A 311).—"Kaystat" water heater, room and cooker thermostats accompany "Kaylite" electric fires, "Kayvec" convectors (illus.) and kettles.

Kango Electric Hammers, Ltd. (D 720).—The new model "E" hammer is 30 per cent more powerful than heavy-duty model "D," yet only 2 lb heavier. Other models shown are the intermediate "C" type for hacking, chase cutting, plugging, bush hammering, etc.; the light "S" type for overhead work, scaling, woodworking, etc.; and a spade hammer for clay and trench digging.

H. Kaufmann, Ltd. (A 607/504).—Vacuum cleaners and irons.

Geo. W. King, Ltd. (D 404).—Mechanical handling equipment includes electric chain pulley blocks, overhead runways and the "Safelec" busbar system for track electrification, overhead crane and conveyor components.

K. & L. Steelfounders & Engineers, Ltd. (D 604).—Castings for the electrical industry.

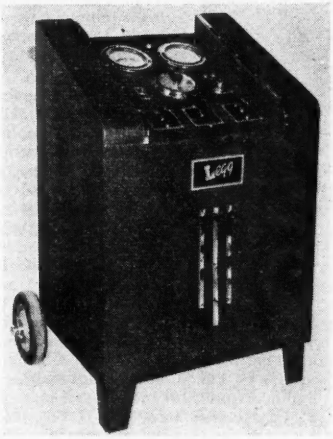
Lan-Bar, Ltd. (A 635).—The "Lan-Bar" electric towel rail has a loading of only 70 W.

Langley Alloys, Ltd. (D 243).—Copper base alloys include "Hidurel 6" (a precipitation hardening copper-chrome material) with high electrical and thermal conductivities employed for spot welding tips and current carriers of all types.

Langley London, Ltd. (C 226).—Mica processed in all shapes. Micanite and "Langboro" laminated plastic tubes and stampings form a display of essential components for the radio and electrical industry.

Leeds Metal Spinning Co., Ltd. (A 523/418).—Aluminium cooking utensils.

Legg (Industries), Ltd. (C 231).—With the



Legg "Fast" battery charger

"Fast" battery charger (illus.) a substantial charge can be put into a battery in about half an hour. The charger is portable and fully automatic, incorporating a battery analyser and an automatic time relay.

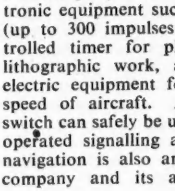
Ley's Malleable Castings Co., Ltd. (D 513/410).—"Black Heart" and "Lepaz Pearlitic" malleable castings are claimed to possess great strength, reliability and machinability.

Liverpool Electric Cable Co., Ltd. (C 320 & 413/316).—Rubber, cambric and paper-insulated cables and flexibles for use in mines, quarries, factories, railways and houses; "Lecupler" bolted flameproof cable couplers; and the new electric vulcanizer for repairing cable sheathing.

Lockers (Engineers), Ltd. (D 502).—"Locker-Traylor" electric vibrating feeders, screens,

conveyors and vibrating process equipment for the industrial heating, drying or cooling of granular and fragmental material.

Londex, Ltd. (C 722).—A tendency towards reduced size is apparent in additions to the range of both relays and synchronous process timers (illus.). The " Lectralevel " liquid level control apparatus, remote flow indicators and photo-electric control apparatus are shown, and the company has developed specialized electronic equipment such as a high-speed counter (up to 300 impulses per second), a light-controlled timer for photographic printing and lithographic work, and a high-speed photo-electric equipment for measuring the landing speed of aircraft. An electro-magnetic limit switch can safely be used in mines. Electrically-operated signalling apparatus for air and sea navigation is also among the products of the company and its associate, Chance-Londex,



Londex synchronous timer type, JPS

Ltd. Fluorescent lighting equipment working from l.v. batteries is available for seadromes.

London Aluminium Co., Ltd. (A 411/312).—"Diamond" aluminium hollow-ware.

London Electric Wire Co., & Smiths, Ltd. (C 320 & 413/316).—" Lewcos " insulated wires and strips, in numerous sizes, with coverings including cotton, silk, rayon, enamel, paper, asbestos and glass for use in power plants, coal cutters, switchgear, radio, etc.; also copper braids and cords, heat-resisting wires and cables and " Glazite " connecting wires.

Longlamps, Ltd. (C 100).—Fluorescent lamps, 1, 2 and 3 ft long and 30 and 40 mm in diameter are obtainable in a variety of shapes and colours.

Joseph Lucas, Ltd. (C 501).—Electrical equipment and accessories for motor-cars, etc.

A. P. Lundberg & Sons, Ltd. (C 507/406).—"Lektrix" electrical accessories include switches, fuses and plugs, motor starters, plugs and sockets, control gear and lighting equipment.

Macintosh Cable Co., Ltd. (C 413/316).—Electric cables of several classes.

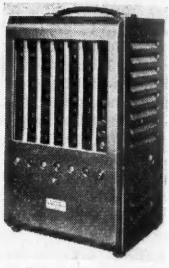
William McGeoch & Co., Ltd. (C 325).—Switch and fuse gear, switchboards, watertight plugs and sockets, lighting fittings (including ship and railway types) and electrical accessories.

Donald Macpherson & Co., Ltd. (B 525).—To demonstrate " Foochow " enamels for electrical gear an attractive spotlighted fountain plays on a well consisting of twelve mild steel tapered plates, coated with switchgear finishes.

Macrome, Ltd. (D 746).—A special thermo-electric process gives the company's cutting tools an added active resistance to wear, fatigue and breakage. A new tool kit is shown.

Magnetic Valve Co., Ltd. (B 300).—Magnetic valves for the control of water, steam, oil, petroleum, gas, air and various refrigerants.

Manuus Manufacturing Co., Ltd. (B 309/208).—Miniature switches, especially for car and radio.



Electronic counter (Marconi Instruments)

Marconi Instruments, Ltd. (D 507).—Interest is mainly directed to a direct-reading pH meter, electronic counter (illus.), detonation meter, and the " Vario-strobe," a portable mains-operated stroboscope for the observation of rotating, reciprocating or vibrating mechanisms in slow or arrested motion. The electronic counter may be used either for counting a million periodic or random impulses at rates up to a million per second, or for the measurement of time intervals up to one second in steps of one microsecond. Other electronic measuring and electro-medical instruments are shown.

Martindale Electric Co., Ltd. (C 732).—Blowers in " Standard " and " Mill-type " models have attachments for conversion into industrial vacuum cleaners. " Commstones " for the grinding of commutators and slip rings in position are another product. The " Jiff-V " portable mica undercutter can be used on commutators of any size. A handy pocket instrument gives definite voltage indications up to 600 V a.c. or d.c. Shown also are the Martindale growler for testing armature windings, grinding tools and operatives' masks.

Matthews & Yates, Ltd. (D 705).—Fans, cyclone separators and viscous air filters.

Measure-Meters Co., Ltd. (D 740).—See Trumeter Co., Ltd.

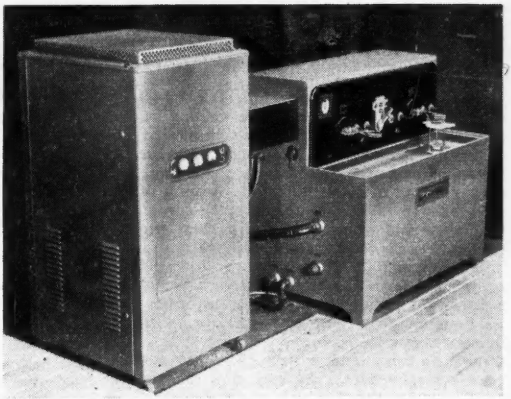
Mersey Cable Works, Ltd. (C 507/406).—Rubber insulated cables and flexibles, include multi-core, braided, lead-covered, armoured and tough-rubber sheathed types.

Metal Sections, Ltd. (D 619/518).—Cold rolled metal sections in steel and light alloys, metal construction and fabrication used for household fittings and decorative and protective finishes.

Metallisation, Ltd. (D 218).—Demonstrations show how the Mark 16 metal spraying pistol can spray superfine coatings of zinc, aluminium, tin, etc., for the prevention of corrosion. The method of reclaiming worn parts such as spindles, crankshafts, armatures, etc.; the spraying of stainless steel on to pump spindles, etc.; and the metal coating of non-metallic articles such as copper on porcelain insulators to eliminate corona are also shown. Of particular interest is a wireless set in which the circuit is sprayed as a production job.

Metalectric Furnaces, Ltd. (C 725/624).—" Ther-Monic " high frequency induction heating apparatus (illus.) is being applied successfully

to surface hardening, brazing, annealing, soldering, melting and sintering, etc.



"Ther-Monic" induction heating set (Metalectric Furnaces)

Metropolitan Electric Cable & Construction Co., Ltd. (C 413/316).—Cables and accessories.

Metropolitan-Vickers Electrical Co., Ltd. (C 510).—Power production and distribution equipment is accompanied by flameproof motors, a h.v. transformer tap changer, a "Transwitch" for rural lines, automatic maximum demand control equipment, "Metrosil" material for clearing lightning discharges, fluorescent lighting equipment for mines, lamps and a model of a gas turbo-alternator.

Metway Electrical Industries, Ltd. (C 302).—In addition to standard mica and ceramic heating elements, conduit fittings and accessories, porcelain accessories, moulded products, flexible metallic tubing and adaptors, special attention is drawn to new p.v.c. armoured flexible conduit tubing, a lead-covered junction box and the "Connectabox" (illus.). Insulating beads are now available in smaller packets for the use of contractors and maintenance engineers. A large number of special heating elements are made to customers' requirements and a patent new toaster element consists of the ordinary type of strip element surrounded

Metway "Connectabox"

by a metal frame which can be adjusted to meet individual requirements. There is a special display of new industrial lighting fittings.

Midland Fan Co., Ltd. (A 622).—Sheet metal work for heating, ventilating and dust-extraction plants; also fans of all patterns.

Midland Metal Spinning Co., Ltd. (A 513/410).—"Tower" brand domestic aluminium hollow-ware includes high-speed hot-plate utensils.

Midland Repetition & Auto Manufacturing Co., Ltd. (A 604).—Electric kettles and hollow-ware.

Ministry of Supply (D 743).—In a section covering Royal Ordnance Factories civilian products made to meet private orders include fabricated parts of a 55-kVA generating set, an electric cooker and ceramics. Another section indicates the possibilities of the gas turbine as a power unit.

Mirrlees Watson Co., Ltd. (D 535).—A demonstration stoker and steam turbine, pumps, condensing, feed heating, evaporating plant, etc.

Moffats, Ltd. (C 505).—Models 42S, 43S and 31 SG cookers are all available in attractive colour combinations. The first two models are also shown in dapple grey to Ministry of Supply N.H.D. specification. Model 294 in ivory finish typifies semi-heavy-duty equipment for large houses, small hotels, etc. A scale model of an enamel fusing furnace can be seen in operation. An all-electric kitchen composed of standard units, incorporates a cooker, refrigerator, water heater and towel airer.

"Monitor" Patent Safety Devices, Ltd. (D 534).—Alarms for power plant include flow meters, flow indicators, pressure alarms and combined indicator panels.

Mono Pumps, Ltd. (D 716).—Among pumps for a variety of purposes is an interesting demonstration unit showing the ingenious hypocycloidal motion of the Mono pump.

Morgan Crucible Co., Ltd. (D 305/204).—"Morganite" brushes for dynamos and motors, carbon current collectors for cranes and trolley booms, trolley-bus collector inserts, all-carbon air dashpots, carbon and "Reservoil" bearings, carbon pile resistors and welding rods.

Morgan Ebonite Co., Ltd. (D 615).—Ebonite sheet, rod, mouldings, linings, coverings, etc.

B. O. Morris, Ltd. (D. 515).—"Morrisflex" flexible shaft machines.

David Moseley & Sons, Ltd. (D 640).—Suction and delivery hose, vacuum cleaner hose, conveyor belting, moulded products, etc.

Moss Gear Co., Ltd. (D 428). A miscellaneous range of gearing, single and double helical worm reducing gears and general sleeve couplings accompany geared motors.

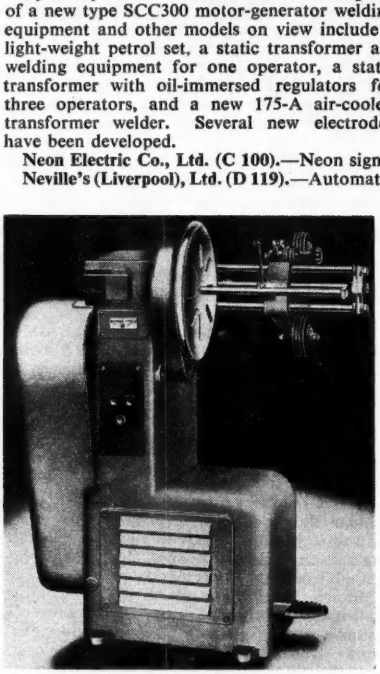
Moulded Products, Ltd. (D 738).—Thermosetting and thermoplastic mouldings; also steel moulds for plastic moulding.

Murex, Ltd. (D 247/144).—A process has been developed for the manufacture of aluminium-nickel-cobalt permanent magnets by powder metallurgy methods.

Murex Welding Processes, Ltd. (D 247/144).—The extensive use of electric arc welding in the construction of oil pipe-lines has necessitated the development of special equipment, including a diesel-engine-driven electric arc welding set (illus.) having an output of 400 A. Among other equipment exhibited is a 250-A self-contained welding transformer fitted with a new timed-relay safety device. Demonstrations are given of a new type SCC300 motor-generator welding equipment and other models on view include a light-weight petrol set, a static transformer arc welding equipment for one operator, a static transformer with oil-immersed regulators for three operators, and a new 175-A air-cooled transformer welder. Several new electrodes have been developed.

Neon Electric Co., Ltd. (C 100).—Neon signs.

Neville's (Liverpool), Ltd. (D 119).—Automatic



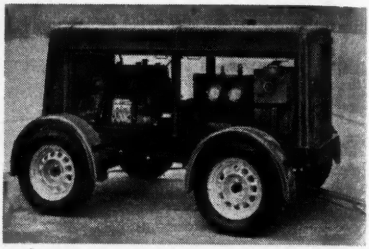
Neville's " Durban " automatic coil-winding machine

coil-winding machines provide for an infinite range of coil widths from $\frac{1}{8}$ in. to 1 in. The " Durban " model (illus.) is suitable for winding shunt, series, interpole, brake and lifting magnet, transformer and blow-out-coils.

New Process Welders, Ltd. (C 118).—A full range of spot, seam butt and flash welding machines and rivet heaters.

Newage (Manchester), Ltd. (D 625).—Generating sets for lighting and industrial purposes.

Newman Industries, Ltd. (C 306).—Principal exhibits here are industrial and fractional-h.p., a.c. motors, including totally enclosed, and flameproof and oil-burner types. There are also



Murex 400-A mobile diesel-engine-driven arc welding equipment for use in oilfields

direct-on-line and direct-on-reversing contactor types and fully automatic star-delta starters, together with " Cotswold " table or desk fans.

Newton Brothers (Derby), Ltd. (A 327/226).—Among uses of automatic carbon pile voltage and current regulators shown are the control of voltages for electronic equipment, torque control for diesel-electric locomotives, train lighting control and regulation of output of generators driven by water turbines. Rotary transformers and convertors, h.f. alternators and h.v. d.c. generators are also displayed.

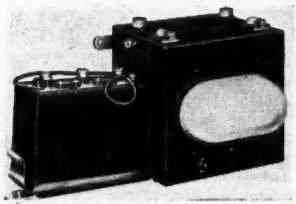
L. H. Newton & Co., Ltd. (C212).—Nuts, bolts, screws and special precision components.

Northern Aluminium Co., Ltd. (D 629).—The long-established use of aluminium for overhead conductors is illustrated by busbar installations, cast aluminium alloy housings for switchgear and motors, grid towers and h.v. substation structures in aluminium alloy extruded sections. Future developments indicated include conduit installations, sheathing and armouring of cables.

Northern Rubber Co., Ltd. (D 730).—Mechanical rubber goods for the electrical industry.

Ocean Radiator Co., Ltd. (D 303/202).—Electric radiators.

Oldham & Son, Ltd. (C 414).—An adaptation of the automatic relay lantern (illus.) used on naval ships provides emergency lighting in public buildings: the lamp is permanently connected to the mains. A new one-piece hand lamp in self service form with charging equipment is among a display of miners' lamps and



Self-contained emergency lighting unit (Oldham & Son)

charging frames; it has a modern Krypton-filled bulb. Other exhibits include a potential divider and current control apparatus for meter testing equipment, garage chargers, marine signalling and "Tuba" torches, and traction, marine and starter batteries.

Omes, Ltd. (D 533).—Forgings made by the electro-forging method.

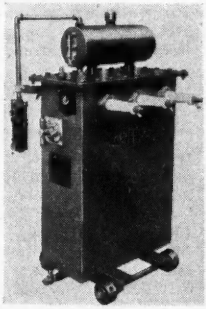
Ormond Engineering Co., Ltd. (C 205).—Toasters, hair dryers and electrical accessories.

Osborn Manufacturing Co., Ltd. (C 111).—Lighting fittings comprise of three-light pendants in "Perspex," wood and wrought iron, with parchment and glass shades; table lamps and lamp standards.

Parker, Winder & Achurch, Ltd. (B 606).—"Parwinac" automatic electrically controlled oil burners.

Parnall (Yate), Ltd. (C 101).—Two-stage thermostatic oven control, extra quick pre-heating and magnetic door catches are special features of a new range of streamlined cookers for the home market. A special export model cooker has been designed to meet competition abroad. A point of interest in connection with a new breakfast cooker is that no door is provided for the grill compartment.

Partridge, Wilson & Co., Ltd. (C 305).—While concentrating on "Davenset" plating rectifiers and ancillary plating equipment, this company is also showing power transformers for rural distribution, commercial battery charging equipment and an ingenious automatic sump pump.



25-kVA "Davenset" oil-immersed indoor type transformer with conservator (Partridge Wilson)

P. B. Sillimanite Co., Ltd. (C 620).—Electrical insulation ceramics, heat-resisting bricks and cement coatings for furnaces, refractory and electrical insulation cements.

Peglers, Ltd. (B 421).—Engineers' fittings.

Perry Barr Metal Co., Ltd. (D 725).—See Birmid Industries, Ltd.

Philips Electrical, Ltd. (C 609).—Tungsten, fluorescent and discharge lamps and lighting fittings are accompanied by h.f. heating generators, arc and resistance welding plant and electrodes, magnetic filters and rectifiers.

Phœnix Sales, Ltd. (A 607/504).—Vacuum cleaners and irons.

Pinchin Johnson & Associates, Ltd. (B 625).—Coatings for protection and decoration of industrial products of all kinds.

Pirelli-General Cable Works, Ltd. (C 413 316).—Electric cables and accessories.

Pneulec, Ltd. (D 626).—In addition to the "Royer" sand mixer, "Jarr" squeeze strip and rollover machines, there is a scale model, with individual items of equipment, of "Hydro-Blast" apparatus for cleaning castings.

Poles, Ltd. (C 323).—"Adastra" galvanized sectional steel poles; also climbing shoes for poles.

Power Centre Co., Ltd. (C 707).—Industrial electrical distribution gear includes overhead busbar and cable trunking systems, busbar chambers, switch and fuse gear, switchboards, link boxes, sealing chambers, glands, etc.

Premier Electric Heaters, Ltd. (C 206).—"Pylon" and "Quickset" kettles, "Laundwell" irons, heat-controlled irons, irons for laundries and tailoring, fires, bowl fires, toasters, coffee percolators, hot-plates and sterilizers.

Pressed Steel Co., Ltd. (C 303/204.—"Prestcold" domestic refrigerators of 3·1 and 4·44 cu ft capacity are accompanied by commercial service cabinets, ice-cream conservators and condensing units.

Pritchett & Gold & E.P.S. Co., Ltd. (C 702).—Uses of accumulators represented cover country house lighting, telephone exchanges, power stations, switch-tripping equipment, train lighting, car starting, lighting and ignition ("Dagenite"), aircraft (Peto & Radford units fitted with "Porvic" microporous plastic material separators) and aircraft starter batteries as used on airfields.

Pyrotenax, Ltd. (C 724 & D 534).—The properties of Pyrotenax mineral insulated copper-covered cables are illustrated by demonstrations. Attention is drawn to the adaptation of the cold screw-on pot type seal to various types of fittings.

Quasi-Arc Co., Ltd. (C 317).—Demonstrations illustrate the application of electrodes, which include the recently improved "Chromoid No. 2" for welding all types of 18/8 stainless steels and a new electrode for welding aluminium 5 per cent silicon alloys. The new "DE 300" transportable set incorporates a Ruston two-cylinder diesel engine and an entirely new type of welding generator which provides a current range of 20 to 300 A and has the latest dual control of both welding current and open circuit voltage. The "Lightweight" portable petrol-engine driven arc welding set, various transformer sets, a new motor generator set, and a high-frequency oscillator for use with a.c. transformer type equipment, are accompanied by a recent addition to the range of the Quasi-Arc dynamic weld testers.

Ramus Manufacturing Co., Ltd. (B 612).—"Hystan" imitation electric coal fires.

Rapid Magnetting Machine Co., Ltd. (C409).—Among electro-lifting magnets and other magnetic equipment used for purification, extraction, reclamation, protection and transportation is a new "Barrel" type electro-magnetic separator which includes an automatic discharge device. As an alternative to the "Permaflux" non-electric pulley there is an

Rapid electro suspension magnet

electro - suspension magnet (illus.), which is placed in an inclined position at the end of the conveyor. The new "Magnaclamp" device for holding work is also demonstrated.

Rawlplug Co., Ltd. (C 703). — Besides Rawlplugs are newer devices designed to overcome peculiar fixing problems.

Radio Heaters, Ltd. (C 221).—The new small eddy-current soldering and brazing machine (illus.), is suitable for direct use in production lines, while a small r.f. welder for thermoplastic sheet materials welds all commercial thicknesses of p.v.c. down to 0·005 in. An electronic process timer used in both these appliances ensures that constant heat input is provided, regardless of mains voltage variations.

Small eddy-current soldering and brazing machine (Radio Heaters)

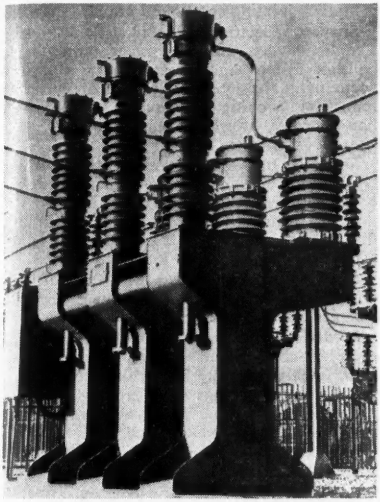
Record Electrical Co., Ltd. (C 720).—A new pressed steel case instrument is available with 4-in., 6-in and 8-in. dials. All types are of identical appearance and are easily convertible from projecting to flush mounting, the square flange of the escutcheon plate improving the appearance. Portable instruments, insulation test sets, etc., include a combined insulation and continuity tester in teak case, and a universal ohmmeter with three ranges (0 10, 0 100 and 0/100,000 ohms) changed by rotating the 6-in. dial. The Shirley static eliminator, which removes charges from textile fibres, is demonstrated.

Revo Electric Co., Ltd. (C 301 & B & D Outdoor).—The streamlined "Princess" cooker (illus.) is supplied with the usual 10 in. by 8 in. grill-boiler and 8-in. dia. boiling plate, or with two 8-in. dia. hot-plates and a separate 10 in. by 8 in. grill. The "Revostat" oven regulator is standard, but the "Superspeed" or "Rediheat" radiant plates are optional. The new all-sheet-steel "Peerless" cooker for flats, etc., incorporates an oven (with top and bottom heat) with a hot-cupboard alongside. Other new appliances are the "Revomatic" kettle, a heat-controlled iron with indicator light, the "Dandy" portable table grill-boiler and the "Electrajug." "Challenge" and "Portex" irons, fires, tubular heaters, "Jubilee" cookers, etc., can also be seen. Industrial and house service switchgear is available in either cast-iron or the new die-cast alloy cases. The Revo consumer's service unit, the "Trufolite" industrial reflector in a new pattern known as "Fullalite" for 4-ft 40-W lamps, the "Sol-Etern" street lantern and a new street lighting fitting for blending the light from one 140-W sodium lamp and two 100-W tungsten lamps are other items of interest. At each entrance to the Fair are street lighting standards including the new "Phidias."

Revo "Princess 462" cooker

Reynolds Tube Co., Ltd. (D 621/520).—Manipulation of steel and light alloy tubes and extruded sections is illustrated.

A. Reyrolle & Co., Ltd. (C 405).—A selection of metalclad and open-type switchgear is shown, together with demonstration panels of protective systems for feeders and busbar-zone protection, and a selection of relays. A 66-kV small-oil-volume open-type circuit-breaker (illus.) is single-break and pneumatically operated. It has a making- and breaking-capacity rating of 1,500 MVA. Operation is very rapid, and the turbulator and contact construction ensure that its performance is consistent over the complete range of operating duty. Three post-type current transformers are mounted on the framework close to the circuit-breaker. A typical metalclad horizontal-draw-out switchgear panel shown (5 BST) is suitable for service up to 11 kV, and has a making and breaking capacity rating of 500 MVA at 11 kV and 6·6 kV. The unit panel is rated at 2,000 A, and the circuit-breaker is magnet-operated. Improvements in design include a newly designed mechanism, modified secondary wiring, and a "Perspex" circuit-breaker tank window.



Reyrolle Class OS 66-kV circuit-breaker

A medium-voltage panel (S 224) with its air-break circuit-breaker (current-rating of 1,200 A breaking-capacity 25 MVA at 400 volts) is specially applicable to the control of power-station auxiliaries and industrial installations. For industrial service, too, there is switch-and-fuse air-insulated medium-voltage distribution-switchgear, with the newly designed class GP cartridge-fuses. A 1,600-A air-break off-load isolator is also shown. Protective equipment is available for all requirements.

Rheostatic Co., Ltd. (C 500).—Temperature control devices include the " Satchwell " cooker thermostat, types " Y " and " Z " immersion thermostats, and the " Q " type room thermostat for controlling electric space heating and also for central heating control in conjunction with motorized valves or other devices.

Joseph Rhodes & Sons, Ltd. (D 323).—Sheet metal working machinery.

Rhymney Engineering Co., Ltd. (D 331/228 & 241).—A model of a skip-winding equipment for collieries demonstrates its completely automatic operation.

Riley Stoker Co., Ltd. (D 241).—Models show automatic stokers applied to various types of boilers and kilns. " Syntron " electric vibrators and feeders are of particular interest.

" Riva " Fireplace Co., Ltd. (B 707).—Electric fireplaces.

Robot Glass Cleaner Co., Ltd. (C 224).—Over a thousand glasses an hour can be washed by this company's electrically operated machine. No drying is necessary.

Rollnick & Gordon, Ltd. (C 726).—See R. G. Dixon & Co., Ltd.

Rotherham & Sons, Ltd. (D 624).—Among precision instruments are special timing devices, pressure gauge movements and time lags.

J. Rowell & Son, Ltd. (A 650 and D 534).—" Ace " electric washing machines are available with or without electric heating units.

Rozalex, Ltd. (D 706).—Particular attention is drawn to the anti-dermatitis properties of " Rozalex."

Ruberoid Co., Ltd. (B 423).—Electrical insulating materials.

Rubery Owen & Co., Ltd. (D 717/616).—An associated company, Invicta Electrodes, Ltd., shows arc welding electrodes, accessories, etc.

E. Rudd & Co., Ltd. (C 216).—Nameplates of all types are a speciality.

Runbaken Electrical Products (C 728).—The " Thermotap " car immersion heater (illus.), " Fastcharge " battery charger, the dual " Testoscope " and the " Echo " test set for armatures, stators and coils are among items shown.

Runbaken car immersion heater

Ryland Works, Ltd. (A 519).—"Briteheat" electric fires and cooking oven thermometers.

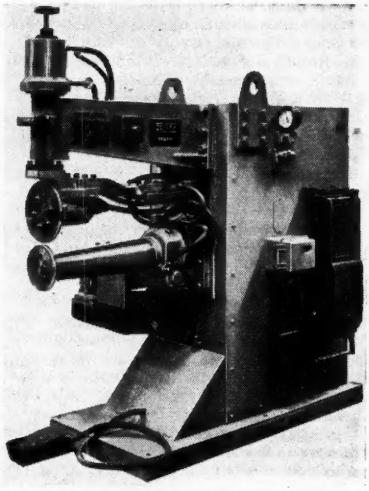
St. Helens Cable & Rubber Co., Ltd. (C 413/316 & D 745).—Electric cables of various types.

J. H. Sankey & Sons, Ltd. (B 406).—Refractory, insulation and acid-resisting materials.

Schori Metallising Process, Ltd. (D 524).—Demonstrations are given of powder flame spraying of metal and plastic coatings.

Scottish Cables, Ltd. (C 319).—A novel background to a display of samples of paper and rubber insulated cables is in the form of an open book illustrating different aspects of the company's organization and activities.

Sciaky Electric Welding Machines, Ltd. (C 222).—A new three-phase balanced loading resistance welding plant requires only one-third of the power normally taken by single-phase machines. A light alloy flash-butt welding machine has been developed for window-frame extruded sections, and a hydraulically operated spot welding plant demonstrates the principle of multi-head arrangement. The " R.A.M.C. 100 " electronically controlled circumferential seam-welding machine (illus.) seen in operation is capable of welding a large range of mild steel plate thicknesses as well as pressure-tight seams in aluminium alloy. The 25-kVA spot welding machine operates at up to 150 welds per minute and a " P.M.I.P." air operated fully controlled projection welder is actually welding production component parts. The company's portable machine range is

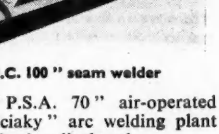


Sciaky " R.A.M.C. 100 " seam welder

represented by a " P.S.A. 70 " air-operated machine. " Aston-Sciaky " arc welding plant with stepless control is also displayed.

Senior Economisers, Ltd. (D 241).—Three economisers shown, H-tube, twin tube and welded models, cover the requirements of all types of boiler plant and effect substantial fuel savings.

Sharp Control Gear, Ltd. (C 211).—Cam-



This controller (Sharp Control Gear) gives three speeds, forward and reverse

operated contactors from 10-70 A are suitable for controlling machine tools, pole-changing switches, star-delta starters, trucks, electric vehicles, etc. Controllers (illus.) giving three speeds, forward and reverse, are shown, together with a new range of push-button starters.

Sheffield Smelting Co., Ltd. (D 731).—Precious metal contacts for switchgear, ignition, relays and telecommunication equipment; silver solders and brazing alloys; silver anodes and plating salts, and thermocouple wires.

Siemens Brothers & Co., Ltd. (C 413/316).—Electric cables and accessories.

Sigmund Pumps, Ltd. (D 337).—Non-clogging centrifugal pumps are specialities.

Simmonds Aerocessories, Ltd. (D 427).—A special feature is made of " Pinnacle " metal diaphragm nuts, elastic stop nuts, " Hi-Shear " stop pins, " Spire " nuts, fixings and clips. " Pacitor " electronic contents gauges and " Jontix " jointing compound are also displayed.

Simplex Electric Co., Ltd. (C 507/406).—Simplex switch and fuse gear, conduit and conduit fittings and street lighting equipment accompany the latest " Creda " domestic and industrial cooking appliances, wash boilers, hand dryers, washing machines and water heating equipment.

Smart & Brown (Engineers), Ltd. (C 403).—" Hi-craft " a.c. switches (5-, 13- and 15-A) in both coloured plastics and metal incorporate a novel movement. Instant start " Duralite " fluorescent lamps 2 to 8 ft long in many colours accompany control gear and fittings.

James Smellie, Ltd. (B. 628).—In addition to normal types of electric fires there are interchangeable coal and electric models.

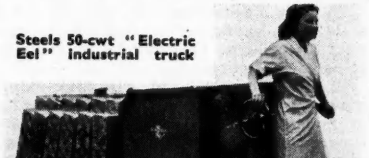
Frederick Smith & Co. (C 320).—Bare copper, cadmium-copper and bronze wires and bars from 0·0001 in. to 2¾ in. in diameter, strip for transformer windings and strand for power transmission and line wires; also trolley wires, commutator and busbar copper, etc.

Smiths Industrial Instruments, Ltd. (D 727).—The " Desynn " system of remote indication has been supplemented by a.c. operated units under the names of " Asynn," " Autosynn " and " Telesynn." Smiths A.T. magnetic indicators which can be waterproofed and tropicalized are available for practically every form of speed indication, while a triple range hand tachometer gives accurate r.p.m. readings instantly from any rotating machinery and feet or metres per minute readings for belts, conveyors, etc. Other interesting instruments are an electric revolution indicator counting device, pressure, vacuum and compound gauges, thermometers and thermostats.

Spencer-Bonecourt, Ltd. (D 407/306).—See Babcock & Wilcox, Ltd.

Spiral Tube & Components, Ltd. (A 327/226 & D 708).—The new Mark III " Spirette " unit heater incorporating a 4-kW element and an extra-quiet motor.

Steels Engineering Products, Ltd. (B 617 & D Outdoor).—A one-ton Coles mobile electric crane demonstrates the performance of these full-circle-slewing versatile models. " Electric



Steels 50-cwt " Electric Eel " industrial truck

Eel" industrial trucks (illus.) with their "body-weight" steering include a 30-cwt load carrier, a 50-cwt low lift stillage truck, a 40-cwt tiering truck and heavy-duty tractor trucks. Coles electric hoists are available in 10 cwt to 6 ton capacities.

Standard Telephones & Cables, Ltd. (C 225/104 & 413/316).—Electrical communication and allied equipment applied to commerce, transport and industry; also electric cables.

Stanton Ironworks Co., Ltd. (B 717/626 & B Outdoor).—Lighting columns are to be found among a selection of pipes of iron, spun concrete and concrete lined iron.

Stephens Belting Co., Ltd. (D 233).—V-belt drives and transmission belting, gaskets and other sealing materials.

Sterling Cable Co., Ltd. (C 233).—An exact model of the drum used for paper-insulated, lead-covered and armoured cables, which are available for all pressures up to 11,000 kV, forms this stand. Rubber and thermo-plastic insulated cables and flexibles include a great variety of coloured flexible leads made specially to harmonize with appliances.

Stewarts & Lloyds, Ltd. (D 511/408).—Tubes, poles, joints, steel castings, tubular steel lighting standards, etc., are specialities.

Stirling Boiler Co., Ltd. (D 407/306).—See Babcock & Wilcox, Ltd.

James Stott & Co. (Engineers), Ltd. (C 727/626).—Electrically-heated catering equipment includes water boilers, café sets, food steamers, hot-cupboards, frying ranges, boiling pans, and urns. The No. 1 boiler has been specially designed to deliver large quantities of water. Among hot-cupboards made to suit customers' individual requirements is an aluminium model with anodized finish. The "Broadway" pressure steamer, a new boiling pan with a distinctive stepped base and a concealed draw-off tap, and a milk or soup warming cabinet are other items of particular interest.

Sturdy Electric Co., Ltd. (D 534).—Lighting control gear.

W. & S. Summerscales' Sons (A 521).—The "Scales" electric washer has an improved method of agitation which, instead of beating the fabric with an agitator, flushes out the dirt

Pressed-steel wringer (W. & S. Summerscales' Sons) which can be fitted to any make of washing machine

by surging water action only. A pressed-steel wringer (illus.) with patented safety device, can be fitted to any make of washer.

Sumo Pumps, Ltd. (C 604).—Features of the Sumo submersible electric pump are simplicity of installation and removal, 6,000/10,000 hours' running time without special maintenance, no noise, no lengths of shafting or rodding to ground level and no lining up of bearings, low current consumption and minimum of piping and wiring.

Taylor & Challen, Ltd. (D 415).—Presses and other machines for steel metal working.

Telsen Electric (1935), Ltd. (C 721).—Among electrical appliances and electrical accessories are fires, kettles, boiling rings, chimes, blankets, toasters, irons, meters, loudspeakers, soldering irons, immersion heaters, plugs, sockets, switches, switch-plugs and connectors.

Herbert Terry & Sons, Ltd. (B 424).—"Anglepoise" adjustable lamps.

Bertram Thomas (Engineers), Ltd. (D 309).—A collapsible model of the company's electric buffet has been developed to save shipping space for export. Cylindrical type plate warmers are made in three sizes holding from twelve to thirty-six plates. Among "Tunnel" electric heaters are a skirting unit and car pre-heaters.

H. Thompson (C 102).—Electric fires, boiling rings, heaters, wash-boilers, cookers, kettles, wall heaters, fluorescent lighting fittings, fire and iron elements.

John Thompson, Ltd. (D 521/418).—Scale models of complete boiler house installations and water treatment plant accompany examples of pressed boiler ends, coated with "Herculoid" anti-corrosion compound, stokers, high-pressure pipework, special flanges and castings.

Thorn Electrical Industries, Ltd. (C 313).—Among "Atlas" incandescent and fluorescent lamps and lighting fittings especial interest centres around a new 40-W fluorescent tube only two feet long, i.e., half the size of the usual 40-W types. In addition to "daylight" and "warm white" the new tube is made in an attractive new warmer colour—"peach" which is also available for the larger tubes. Especially designed for the new tubes is the GR/2240 fitting incorporating a "Quickstart" unit which dispenses with the usual starter switch, allows almost instantaneous starting of the tubes and keeps them alight even under conditions of voltage variation. A feature of several new fluorescent fittings is the use of ribbed "Perspex" as a diffusing medium. The "Mary Ann Two-way" and "Bedalax" vacuum cleaners are demonstrated, together with the "Mary Ann Doubleway" iron.

Trico-Folberth, Ltd. (C 309).—Motor car electrical equipment.

Trumeter Co., Ltd. (D 740).—Electro-magnetic counting, measuring and speed-recording units.

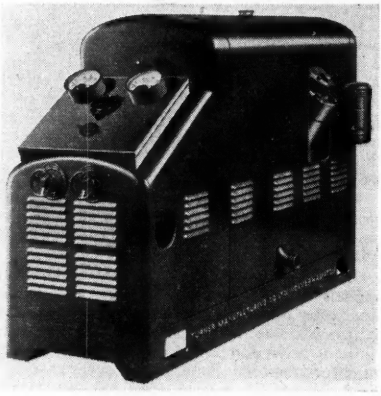
Tube Products, Ltd. (D 621/520).—Methods used for testing "Tru-Wel" electrically welded steel tubes are particularly interesting.

Tudor Accumulator Co., Ltd. (C 109).—Among stationary cells of both open and sealed types for lighting installations, telephone exchanges and switch operation is a 110-V battery operating a 150-MVA, 11-kV oil circuit breaker as used in power and substations. A

" Safetylyte " emergency lighting system is operating on the 110-V battery. Traction, marine and submarine batteries are also shown.

Turner Brothers (Birmingham), Ltd. (D 512).—Newcomers to the range of fabricated power presses are " TB 6 " (6-ton) with adjustable stroke, and the " TB 20 " (20-ton) ungeared. Press tools, jigs and moulds are also displayed.

Turner Manufacturing Co., Ltd. (D 316).—In addition to diesel engines this exhibit comprises a new totally enclosed generator set,



Self-contained lighting set (Turner Manufacturing Co.)

farmer's generating set, pump unit and 50-ton press.

Union Cable Co., Ltd. (C 413/316).—Cables of various types.

Universal Steel Door & Engineering Co., Ltd. (B 613/512).—Transmission line towers.

Vactite Wire Co., Ltd. (C 320).—" Eureka " nickel-chrome resistance wires and tapes, molybdenum rods, wires and tapes for electric furnaces, lamps and valves; also copper clad and " Vac-Steel " wires.

Valbania, Ltd. (B 712).—Lighting fittings.

Van Dorn Electric Tools (C 607).—Portable electric tools.

Veret, Ltd. (C 620).—A thermostatically-controlled electric bedwarmer.

Walker Fender Co., Ltd. (A 230).—Metal floor and table standards, in antique finishes of brass, copper, oxidized silver and chromium plate.

Walls, Ltd. (A 313).—Electric fires, kettles, breakfast cookers and aluminium hollow-ware.

Walsall Conduits, Ltd. (C 715).—" Walsall " steel conduit, conduit fittings, switch-plugs (including weatherproof types), switches, fuseboards, switchgear, industrial lighting equipment, cable and busbar trunking, underfloor ducting, the company's metal-sheathed wiring system and electric heating appliances.

Warico (Great Britain), Ltd. (B 622).—Electric fireplaces.

H. Webb & Co. (Engineers), Ltd. (C 203).—See Hotric, Ltd.

H. C. Webb & Co., Ltd. (A 511).—An electric mower.

Weldall & Assembly, Ltd. (B 304).—The " Udesignit " patent kitchen units can be made to fit any size of kitchen and include refrigerator, washing machine, cooker, etc. Fractional h.p. electrically-driven " Dryall " mobile grass drying machines and other products also appear.

Westinghouse Brake & Signal Co., Ltd. (C 508).—In the past year this company has produced a number of oil-cooled rectifier equipments, some for outdoor use, for d.c. supplies to magnetic separators, vibrating screens and lifting magnets, with outputs up to 25 kW at 230 V. Apparatus has also been supplied for electrolytic baths for the production of hydrogen and chlorine, and an interesting innovation is a sealed rectifier for use with an induction alternator on motor cycles. To demonstrate the various applications of the Westinghouse metal rectifier, photographs are supplemented by demonstrations of some of the more important uses such as electro-plating, projector arc power supply, constant voltage battery charging and e.h.v. for anode supply to cathode-ray tubes.

Wild-Barfield Electric Furnaces, Ltd. (C 321/220).—Covering the toolroom and small production side are the " TRT 1010 " toolroom tempering furnace, the horizontal " Workshop " furnace and the " ESB Minor " electrode salt bath. The " Workshop " furnace is fitted with a " Paragen " burner which produces an atmosphere giving practical freedom from decarburisation during heat-treatment to a wide range of engineering steels. Full-scale production furnaces are represented by a standard horizontal " Heavy Hairpin " batch type furnace fitted with a " Paragen " burner. Induction hardened, brazed and soldered samples treated by Ferranti-Wild-Barfield equipment are also shown, and dielectric processes are covered. Analytical equipments include the " Vickers Pyramid " hardness testing machine.

A. H. Wilkes & Co. (D 505).—A new type of soldering iron is introduced.

Wilkins & Mitchell, Ltd. (C 713).—A model of the standard " K " washing machine with a heatingelement fitted is reserved for export.

Wilkins & Wright, Ltd. (B 201).—Electrical fittings comprise canopies, galleries, ceiling plates, chains and switch plates.

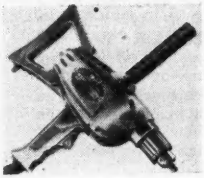
Williams (Birmingham), Ltd. (A 413/314).—" Atlas " hot-plate utensils for electric cooking.

W. & A. Williamson & Co., Ltd. (A 524).—" Beta " electric fires and " Betaware " aluminium hollow-ware.

Willmot Trucks, Ltd. (D 644).—Power-operated elevating trucks and fork lift trucks.

Wireohms, Ltd. (C 716).—Electric heating elements for domestic and industrial appliances include mica, refractory, heating spiral and immersion types, as well as special elements.

S. Wolf & Co., Ltd. (C 603).—Portable electric tools comprising drills, screwdrivers, grinders, polishers, sanders, blowers, chisel mortisers, hammer kits, etc. The new "SD4c" ¼-in. general duty drill (illus.) can be mounted on a drill stand to form an efficient drill press. Engine reconditioning equipment includes valve seat grinders and valve and engine servicing kits, valve refacers and the "Mobilectric" engine workshop.



Wolf "SD4c" ¼-in. general duty drill

Wolseley Sheep Shearing Machine Co., Ltd. (D 713).—Electric fencers for controlling farm live stock, cattle and pig drovers, horse and cattle clippers and sheep shearing machines.

Yale & Towne Manufacturing Co., Ltd. (D 423/324).—Electric handling equipment includes stackers.

Yardley Wavis, Ltd. (C 704).—Electrical generating plant driven by petrol, paraffin and diesel engines, for industrial and domestic use.

Yorkshire Copper Works, Ltd. (B 725/634).—"Yorcalbro" (aluminium brass) and cupro-nickel condenser tubes for power station steam condensers are a prominent feature of this stand.

Zinc Alloy Rust-Proofing Co., Ltd. (B 722).—This company specialises in rust-proofing electric conduit, etc., by the "Sherardizing" process.

The London Section

Olympia and Earls Court Exhibits

Aircraft Patents, Ltd. (J. 164).—"A.P.L." electric alarm, table, wall and nursery clocks.

Albion Light Metal Products, Ltd. (Earls Court V 31).—Refrigerators.

Allen & Hanburys (Acoustic Aids), Ltd. (C 27).—The compact new "Bonochord Duo-Minipak" hearing aid weighs only 6½ oz complete. A simple adjustment converts it to a high power "Duopak" for use over long periods.

Ashdowns, Ltd. (Earls Court Q 35).—Mouldings indicate the company's ability to produce large components either by compression or injection methods. Also displayed are "Ashlam" synthetic resin bonded boards for electrical insulation and mechanical applications, silicone bonded glass cloth for high temperature electrical insulation, fabrications in "Perspex" and other thermoplastic sheet materials and extrusions.

Avimo, Ltd. (C 36).—Two new oscillograph recorders have been designed. The new continuous recording camera has three interchangeable gear boxes giving a speed range to the 70 mm. film of from 2 to 1,000 cm. per minute. The other model is a neat and economical single-shot camera for non-continuous recording 35 mm. film.

Baird & Tatlock, Ltd. (C 32).—This company's new "Warburg" apparatus for the examination of living tissue is of special interest.

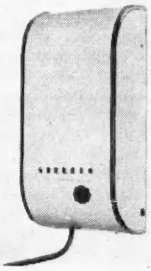
Bakelite, Ltd. (Earls Court Q 9).—How bakelite plastics are solving industrial problems is the theme of this display. The impregnation of wood and the production of grinding wheels and cements for plywood are typical uses.

Baldwin Instrument Co., Ltd. (C 49).—Particular attention is drawn to X-ray dosemeters, the "Baldwin-Farmer" electrometer for small condenser chambers, an electrometer using a radium-activated ionization chamber, the N.P.L. moisture meter, mouldings, a photographic exposure meter, a mains resistance meter, a light-spot galvanometer, a visual null indicator and an apparatus for use on steel rolling mills to indicate small reductions in thickness.

Beetle Products Co., Ltd. (Earls Court Q 36).—See British Industrial Plastics, Ltd.

Bellingham & Stanley, Ltd. (C 25).—Photometers, colour testing apparatus, etc.

C. H. Blackburn & Co., Ltd. (C 82).—In addition to "Stellex" instrument sterilizers new electro-medical equipment includes a balanced pulse generator for re-education of muscles weakened by paralysis, including infantile paralysis. An electromyophone indicates by characteristic sounds impending recovery, or otherwise, of paralysed muscle. A portable mains unit provides all current wave forms commonly used in physiotherapy. A new electrically heated food conveyor is contructed in light alloy on a steel chassis. The company's range of immersion heaters is now supplemented by a 1½-gal. thermal storage heater (illus.) designed to mount flat against the wall, the front cover being detachable for easy wiring and plumbing.



1½-gal. "Stellex" water heater (C. H. Blackburn & Co.)

Bowen Instrument Co., Ltd. (C 19).—Indicating, recording and controlling pyrometers with associated thermocouple equipment comprise portable, fixed radiation, disappearing filmament and "Pyrokolor" types. Of particular interest is the "Pyrotron-Chart" 10-in. recorder.

British Ebonite Co., Ltd. (Earls Court Q 59).—Ebonite rod, sheet, tube, mouldings, etc.

British Industrial Plastics, Ltd. (Earls Court Q 36).—Mouldings in Beetle plasticized moulding powder, some carrying heavy inserts, are of special interest to the electrical industry.

British Moulded Plastics, Ltd. (Earls Court Q 26).—Moulded plastics include battery boxes, television masks and line insulators.

British Resin Products, Ltd. (Earls Court Q 50).—Plastic materials.

British Rototherm Co., Ltd. (C 88).—"Bimetallic," easily read, dial-type thermometers for industrial and domestic use.

British Vacuum Cleaner & Engineering Co., Ltd. (F 22, H 55, J 120, K 8 & Earls Court X 4).—Magneta time recorders, job costers, public address equipment, synchronous clocks and "Loudspeakerphone" internal telephone systems appear on Stand F 22, and the "Teasmade" automatic tea making appliance on Stand K 8; with "Time-Spot" radio, radiograms, Magneta radio sets, amplifiers and public address systems on Stand H 55; and clocks and timing apparatus on Stand J 120. At Earls Court are shown "Goblin" vacuum cleaners and B.V.C. light industrial portable cleaners.

B.X. Plastics, Ltd. (Earls Court Q 15).—Thermo-plastic materials, p.v.c., polystyrene, etc.

Bylock, Ltd. (Earls Court X 9).—The "Triplex" domestic and "A.M." industrial vacuum cleaners, the "Duplex" floor polisher, hand dryers, industrial blowers and "Simoon" and "Streamline" hair dryers form this exhibit.

Cables & Plastics, Ltd. (Earls Court Q 54).—P.v.c. tubing, "Capothene" cables (insulated with "Polythene" and sheathed with p.v.c.) and "Capovin" cables (insulated and sheathed with p.v.c.) are made in a great variety of opaque and translucent colours.

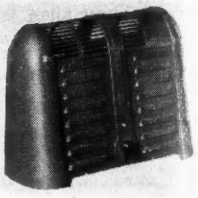
Cable & Wireless, Ltd. (A 7).—A new photo-telegraphic transmitter-receiver is demonstrated.

Chance Brothers, Ltd. (R 14 & 15).—Opal lighting glass ware, shades, globes, spheres and cubes.

Cinema-Television, Ltd. (C 42).—Electronic metal detectors, counters, batching units, decimal counter chronometers, oscilloscopes, a two-channel electronic switch and an audio oscillator are among instruments shown.

E. K. Cole, Ltd. (H 44 and Earls Court Q 55).—The display at Olympia is devoted to Ekco radio, car radio and television apparatus. Tropicalized models of radio receivers have special short-wave provisions. Plastic moulding developments are displayed at Earls Court.

John Compton Organ Co., Ltd. (H 5a).—The "No. 3" space heater (illus.) shown for the first time has a four-way switch giving 2, 1 or ½ kW and "off". The pre-oxidized nickel-chrome elements run at black heat, and the new "Durestos" material used for the case is claimed to be stronger and lighter than steel and to withstand rough treatment: it is fire-proof, and cannot be overheated.



Compton "Model 3" space heater

A.C. Cossor, Ltd. (H 15).—Radio receivers, radiograms, television sets, valves, cathode ray tubes, electronic instruments, oscillographs, ganging oscillators, valve voltmeters, cardiographs and marine and aeronautical radar navigation equipment are shown, together with various domestic electrical appliances.

Stanley Cox, Ltd. (C 56).—New electro-medical apparatus includes the "Orthotron" for diagnosing muscle and nerve complaints; the "Rheotron," a comprehensive therapy unit; the "Intertherm" radio frequency generator; the "Theracisor" portable radio frequency generator; the "Myograph" amplifying unit for diagnosing nerve and muscle complaints; the "Fulguration Unit" for cosmetic purposes; the "Surging Indolor" (illus.) for producing muscular contraction, and the "Troup No. 4" table model infra-red lamp.

"Surging Indolor" (Stanley Cox)

Cox-Cavendish Electrical Co., Ltd. (C 52).—Among electro-medical apparatus are combined treatment tables, paraffin wax baths, Bristow coils, combined galvanic, faradic, sinusoidal sets, diathermy apparatus, endothermy surgical cutting machine, Rhumkorff coils for research laboratories and insulation testing.

Dawe Instruments, Ltd. (C 54).—Interest is centred on the type 202A decade potentiometer, a potential divider of high accuracy for use at audio and carrier frequencies providing voltage ratios between 0·001 and 1,000 in steps of 0·001.

De La Rue Insulation, Ltd. (Earls Court Q 52).—"Hamofil" connecting wires, "Delaflex" insulating sleevings, "Delaron" laminated plastic, "Traffolyte" printing and engraving plastic, etc.

Dubilier Condenser Co. (1925), Ltd. (H 24).—Special attention is drawn to new moulded mica capacitors, three sizes of which cover all the

generally required capacitance values and voltages; moulded metallized capacitors; ½-W high-stability resistors, only 13·8 mm long and 3·8 mm in diameter available in values of 10 to 750,000 ohms at 5 per cent tolerance to 100 to 500,000 ohms at 1 per cent tolerance; and a.c. "Drilitic" capacitors, type "C.M.S."

Duratube & Wire, Ltd. (Earls Court (Q 11).—Among p.v.c. insulated "Durawires" and "Duraceables," flexible conductors and insulating sleevings are several unusual designs.

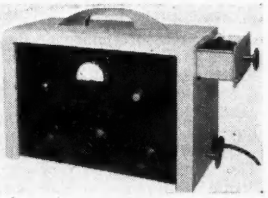
Easco Electrical, Ltd. (H 3).—"Call-Boy" communicator equipment, industrial sound relay apparatus, portable lighting units for mines and industrial use, "Rectostat" home battery charging units, mains transformers and convertor units.

J. J. Eastick & Sons, Ltd. (H 47).—"Eelex" standardized plugs and sockets, testing prods, electrical and radio components.

Ebonestos Industries, Ltd. (Earls Court Q 43).—Plastic mouldings in synthetic and natural resins and bitumen for the electrical industry.

Edison Swan Electric Co., Ltd. (H 25).—A range of "Ediswan" electric clocks is shown for the first time.

A special feature is made of "Mazda" radio valves, including miniature and transmitting types, cathode ray and television tubes. Loudspeakers, headphones and other radio products are represented. "Ediswan" shock therapy equipment is made for the treatment of mental disorders, while the electronic stimulator (illus.) has many valuable uses in the application of therapeutic stimulation and excitability measurements. Vacuum capacitors are available for circuits operating at high peak voltages. Metal-to-glass terminal seals, Ensur-a-lite" emergency lighting equipment, batteries and accumulators, electric welding torches, "Loudspeakerphone" equipment, cables, lamps and lighting fittings are also represented.



"Ediswan" electronic stimulator

W. Edwards & Co. (London), Ltd. (C 38).—Vacuum rotary and diffusion pumps, high vacuum plant and small dual-purpose vacuum pumps and compressors.

Elco No. 209 clock

Elco Clocks & Watches, Ltd. (J 182).—All clocks are fitted with new type movements. Among electric models are the 124D oak mantelpiece model (illus.), the 209 model in cream or blue "Perspex" case with chromium-plated metal base, alarm clocks and a number of battery models.

Electric Art Shades (1928), Ltd. (K 6).—"Electa" bedlights, pendant and reversible gimbal shades, floor standard and clip-on shades, together with a new selection of table lamps and bases in pottery and alabaster, moulded shades, and shades for fluorescent lighting units.

Electric & Musical Industries, Ltd. (H 14).—"His Master's Voice" and "Marconiphone" radio and television receivers are produced for both home and overseas. Transmitters include the E.M.I. general purpose T 1509 model, the "Rebecca Mark 8" miniature lightweight airborne interrogator equipment and the "Emiradio" pedestrian transmitter/receiver. Portable and studio disc and tape recorders, the "Emitron" television camera, a new 405-line television film channel, a dielectric heater, a waveform analyser and public-address equipment are other typical electronic products.

Electrical & Radiological Instrument Co., Ltd. (H 2).—Battery chargers and eliminators for radio, broadcast receiving apparatus, electronic and laboratory instruments.

Electrix, Ltd. (Earls Court X 7).—Special features of the "Silent Electrix" vacuum cleaner are a foot-operated switch and a demothing and deodorizing device. The company's floor polisher incorporates a safety device to prevent uncontrolled movement if inadvertently connected with the switch on.

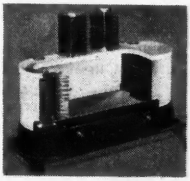
Electrolux, Ltd. (Earls Court X 2).—Quietness is a feature of the company's internal dust bag type suction cleaners which include the new Z 30 model.

Evans Electroselenium, Ltd. (C 51).—"Eel" photo-cells and photo-electric apparatus for medical and industrial applications.

General Chemical & Pharmaceutical Co., Ltd. (B 55).—"Oasis" accumulator acid, electrolytes, distilled water, etc.

General Lighting Equipment Co. Ltd. (Earls Court V 89).—The latest "Gleco-Moderna" products include the "Princess" pendant lighting fittings and the "Tallboy" floor standards.

J. M. Glauser & Sons, Ltd. (Earls Court X 8). — "Polivac" electric vacuum shoe cleaning machines (illus).



Polivac 310 shoe-cleaner shelf model (J. M. Glauser & Sons)

Goodman Industries, Ltd. (H 61).—Loudspeakers of all kinds.

Hailwood & Ackroyd, Ltd. (Earls Court R 14). Representative collection of lighting glassware.

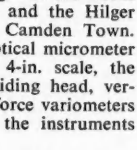
Hale Electric Co., Ltd. (H 22).—Five-valve, three-wave superheterodyne fully tropical radio sets designed for export.

Hanovia, Ltd. (C 72).—In addition to medical ultra-violet equipment are quartz arc tubes for

the activation of Vitamin D; polymerization of vinyl resins; accelerated ageing of paints, rubber, etc.; analytical fluorescence tests, water sterilization, etc. Another new development is a special low pressure quartz discharge lamp, generating u.v. rays of germicidal wave-length.

Hilger & Watts, Ltd. (C 40).—As space permits only a small selection of products to be shown, daily transport is arranged to the works and showrooms of the Watts and the Hilger Divisions at Camberwell and Camden Town. The " Microptic " machine, optical micrometer reading to 0·00005 in. on a 4-in. scale, the Coventry-Watts projection dividing head, vertical and horizontal magnetic force variometers and colorimeters are among the instruments manufactured.

Oswald Hollmann (K 71).—Since this business was re-established two years ago several modern lighting fittings have been developed. Of the latest models on view several incorporate " Opalspun " glass.



Oswald Hollman modern bedside table lamp

Hoover , Ltd. (Earls Court X 1).—Vacuum cleaners of many types.

I.C.I. Plastics, Ltd. (Earls Court Q 42 & 49).—New developments in the manufacture of p.v.c. polymer and compositions are displayed. "Perspex" and "Crinothene" (crepe polythene sheet) are employed for lighting fittings and lampshades.

Ideal Home Electric Appliances, Ltd. (C 84).—Among medical appliances are portable violet-ray high frequency " Vitalators " and " Ozonisers."

Injection Moulders, Ltd. (Earls Court Q 46).—Injection mouldings with and without metal inserts for the electrical and radio industries.

Insulators, Ltd. (Earls Court (Q 39).—Thermosetting and thermoplastic mouldings include many examples made to specifications for the electrical industry.

Kodak, Ltd. (C 122).—An industrial spotlight gives an extremely powerful beam from a 2,000-W lamp with the minimum of heat radiation. The " Kodatron " speedlamp provides an intensely brilliant flash of very short duration (about 1/5,000 sec).

Lamson Engineering Co., Ltd. (F 41/44).—This company makes conveyors of all types; also dust, fume removal, wood refuse, ventilation and industrial vacuum-cleaning plants.

Lighting Glass Manufacturers' Association (Earls Court R 14).—The display is designed primarily to appeal to the overseas buyer. One special feature is the old style decorative art glass lanterns in amber and peach. Champagne and pink coloured spheres, units, etc., have decoration appropriate for the export market. White and coloured units, spheres, and cubes for commercial and industrial use, flakestone and decorative bowls and shades for domestic use can also be seen, together with pressed lighting fittings for railways, transport, shops and other industrial and commercial uses.

London Industrial Art, Ltd. (Earls Court S 28a).—The " Pearlray " light diffuser clips on to standard fluorescent tubes to eliminate glare.

Magneta Time Co., Ltd. (F 22, 455 & J 120).—See British Vacuum Cleaner Engineering Co.

Manchester Oil Refinery, Ltd. (B 39).—Transformer and lubricating oils, etc.

Marconi Instruments, Ltd. (C 74).—The new " Measurtest " receiver tester, valve millivoltmeter, video tester, and f.m. receiver tester are noteworthy for their portability. Several new developments in electro-medical apparatus include a portable universal physiograph which can be used for encephalography, cardiography and myography.

Marconi's Wireless Telegraph Co., Ltd. (H 53).—The latest developments in radio and radar cover police equipment, long-distance communications, television and f.m. broadcasting; automatic direction finding, electronic testing and measuring; commentator's microphones; and " Radiolocator " marine radar equipment. A 2-W v.h.f. combined transmitter and receiver has been developed for use by river pilots. Quartz crystals include a frequency-modulated crystal oscillator for f.m. broadcasting, the forerunner of the unit which will operate the 25-kW transmitter now being constructed for the B.B.C.

Mayfair Shades, Ltd. (K 99).—Lamp and candle shades and other electric lighting novelties.

Measuring Instruments (Pullin), Ltd. (C 4).—The series 85 bench type ohmmeter for production testing has an 8-in. scale, almost linear, with four ranges 0/10, 0/100, 0/1,000 and 0/10,000 ohms: single-, double- and triple-range models are available, together with a self-contained power pack and voltage-stabilizing device. Miniature edgewise indicators can be obtained as ammeters, voltmeters, frequency meters and ratiometers. The 4-in. and 6-in. dial size industrial pattern switchboard instruments can be converted easily for flush mounting. The series 666 resistance and capacity bridge employs a moving-coil meter for the null balance indicator.

Megatron, Ltd. (C 57).—Selenium photo-electric cells of the barrier-layer type made according to a new manufacturing process possess a considerably higher light-sensitivity than those made previously. A new cylindrical model has applications in nephelometers, fluorimeters, smoke detectors, etc., of which some models will also be exhibited. Other uses of photo-electric cells are demonstrated in various devices manufactured by Scargrove Electronics, Ltd., such as switches, counting devices, paper roll alignment control units, thread-breakage monitor units and precipitation absorption meters.

Mentmore Manufacturing Co., Ltd. (Earls Court Q 41).—Injection mouldings for the electrical and radio industries.

Metamec, Ltd. (J 167).—Among electric clocks in attractive wooden cases are alarm models. Reproduction "Sunray" clocks are also available.

Mica Products, Ltd. (Earls Court Q 43).—This company specializes in insulations and plastic materials of all kinds, including machine moulded and fabricated "Perspex" acrilic sheet; synthetic resin bonded paper and fabric, round and square tubes, bobbins and formers; machine stamped and fabricated articles from laminated sheet; presspahn tubes, bobbins and stampings; mica and micanite stampings, washers and tubing. A special feature is made of injection moulded thermoplastics.

Milliwatt, Ltd. (C 89).—In addition to standard electric blankets and pads there are electrically-heated foot muffs and other medical appliances.

Mullard Electronic Products, Ltd. (H 45).—"Ticonal" permanent magnets, air dielectric trimming capacitors, high stability resistors, electro acoustic equipment, communications equipment, electronic measuring apparatus, radio and television receivers, radio valves, electron tubes and other electronic products.

Multitone Electric Co., Ltd. (H 60).—Hearing aids, radio receivers and amplifiers include special equipment for use in schools, churches, etc.

New Welbeck, Ltd. (Earls Court X 5).—Besides operating as an industrial type vacuum cleaner, the company's combined suction and blowing unit can be used for spraying, hot-air drying, etc.

"Ossicaide" (C 80).—Various additions have been made to the range of "Osray" hearing aids. The "NuCaide" lightweight miniature earpiece of aluminium alloy is less than $\frac{3}{8}$ in. in diameter. The company's bone conductor has been redesigned.

Peerless & Ericsson, Ltd. (Earls Court T 29).—About thirty food preparing machines are seen in operation: meat mincers and combination machines, sausage fillers, mixers, potato peelers, chippers, vegetable slicing machines and dish-washers, as well as moulding and filling machines for the large-scale pie manufacturer.

Perihel, Ltd. (C 102a).—Electro-medical appliances include infra-red, ultra-violet and radiant heat appliances.

Permaheat, Ltd. (C 93).—Electrically-heated pads and blankets range from the "Junior" pad (16 in. by 11 in.) to the double-bed "Twin-switch" model (60 in. by 50 in.) which has individual control on each side. Eye and ear compresses with four-temperature control are re-introduced.

"Q-Max" (Electronics), Ltd. (H 23).—Transmitting and communication equipment.

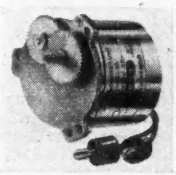
Raymond Electric, Ltd. (H 51).—Among a range of radio receivers the new "Threeway" portable operates on a.c./d.c. mains or self-contained batteries. A new television set also makes its appearance.

Rejafix, Ltd. (E 58).—The company's marking and printing machines can be used on components of almost any shape, size or material, and are especially suitable for electrical apparatus. A fully automatic model is made for mass production marking of round components only.

Rev Motors, Ltd. (N 108).—The smallest type of "Electrotor" miniature motor measures only $\frac{1}{16}$ in. in diameter and $\frac{1}{16}$ wide. A new development, type 250, has the same diameter as the company's type 240 but is half as long again ($\frac{7}{8}$ in. wide by $\frac{7}{8}$ in. diam.); this results in greatly increased power output without increasing consumption. Electrotors are suitable for use in toys and models, scientific instruments, radio-controlled apparatus, pocket-fans, stroboscopes, door chimes, razors, etc. Larger types will be available shortly.

Rollnick & Gordon, Ltd. (Earls Court X 6).—A combined vacuum cleaner and suction polisher, the "Columbus" suction floor polisher and floor polish sprayer.

Sangamo Weston, Ltd. (C 90).—Of special interest are the new Weston 12-in. laboratory standard moving-coil and dynamometer instruments, recently developed sub-standard instruments, the "S 85" photometer, "S 74/715" "Master" photographic exposure meter, "HMT" single-phase quarterly and prepayment type meters, 2- and 3-element polyphase meters, portable test meters, the "SS" synchronous time switch, the "G" synchronous motor and the "S 7" synchronous motor unit, which is available with over twenty-five spindle speeds (from 1 revolution in 7 days to 3,000 per hour) and is supplied with gearing for use in electric clocks (illus.).



Sangamo "S7" synchronous motor clock unit

Selyac Distributors, Ltd. (Earls Court T 32).—The Selyac universal food preparing machine mixes, slices, beats, minces, peels potatoes, kneads dough, freezes ice cream, crushes fruit and makes sausages.

Sifam Electrical Instrument Co., Ltd. (C 12).—Electrical measuring instruments, test gear and equipment.

Smith's English Clocks, Ltd. (J 102 & 104).—Among industrial and commercial electric clocks are time-recorders, process and industrial timers, and tower clocks with striking and chiming mechanisms.

Solus-Schall, Ltd. (C 33).—X-ray apparatus for medical, industrial and laboratory purposes. Electromedical apparatus is also shown.

Stadium, Ltd (Earls Court Q 29).—Electric table lamps, torches and hand lamps.

Sterling-Croydon Clocks, Ltd. (J 180).—Synchronous electric clocks.

Streetly Manufacturing Co., Ltd. (Earls Court Q 36).—See British Industrial Plastics, Ltd.

Sunvic Controls, Ltd. (C 50).—The "Simmerstat" hot plate control, water-heater thermostats, hot-wire vacuum switch tubes and units, aerial change-over switches, adjustable time delay units, adjustable bimetal thermostats, energy regulators, glass-sealed bimetal thermostats and moisture indicators.

S. & W. Lighting, Ltd. (Earls Court R 14).—Lighting glassware.

Synchromatic Time Recording Co., Ltd. (J 166).—Electric clocks include public clocks, master clocks, time recorders, watchmen's clocks, time mechanisms, time switches, process timers and time signals.

Synchronome Co., Ltd. (J 121).—The main display is the Synchronome-Shortt free pendulum with two types of slave clocks as supplied to the Greenwich Observatory. An electrical impulse meter clock, time and programme recorders, automatic bell and hooter programme recorders and an automatic chiming instrument for turret clocks are all shown working.

Taylor Electrical Instruments, Ltd. (H 49).—New radio test equipment and electrical measuring instruments, include the "Wobbulator," which checks receiver alignment by visual tracing of frequency response curve; a 17-range pocket industrial test meter: a 40-range electronic meter; and the "Windsor" audio oscillator (illus.) covering three wavebands from 20 to 20,000 c/s with an accuracy of 4·3 per cent.

Model 190A audio-oscillator (Taylor Electrical Instruments)

Taylor, Taylor & Hobson, Ltd. (C 41).—Two precision measuring instruments of special interest are the "Talysurf" surface roughness measuring instrument and the roundness recorder.

Telsen Electric Co. (1935), Ltd. (H 29).—Radio accessories and measuring instruments.

"Thermega," Ltd. (C 77).—Electrically-heated blankets, pads and special appliances.

Thorn Electrical Industries, Ltd. (H 48).—Ferguson radio and television receivers accompany fluorescent lighting equipment and domestic appliances, details of which are given in the Birmingham section.

H Tinsley Co., Ltd. (C 6).—Precision potentiometers, a.c. and d.c. bridges, galvanometers, laboratory standards, standard cells, a.c. and d.c. stabilizers, resistance boxes, test sets, absorptiometers, timing devices, d.c. amplifiers and apparatus for dielectric testing, magnetic strain and temperature measurements.

T.M.C.-Harwell (Sales), Ltd. (J 122).—"Temco" synchronous electric clocks incorporate "Reservoil" permanently lubricated bearings. "Temco" electric wiring accessories are also displayed.

Toplis, Simpson & Co., Ltd. (C 100).—Electric moisture meter.

Trix Electrical Co., Ltd. (H 42).—Sound amplification equipment is made for every class of public address installation.

Ultra Electric, Ltd. (H 13).—Domestic and school radio and television equipment.

Unicam Instruments (Cambridge), Ltd. (C 1).—Among new instruments are a new spot galvanometer, a photo-electric colorimeter and a quartz spectrophotometer.

Vactric, Ltd. (Earls Court X 3).—The new "W 101" vacuum cleaner has a powerful three-fan suction and is finished in "Dimenso."

Waite & Son, Ltd. (K 32).—Table and floor standard lamps, decorative lighting fittings and "Astrashades."

Warm-Glow Co. (Earls Court W 12).—In a full-size single bed a standard low-loading electric blanket without thermostat is continuously demonstrated: in average use the running cost is only 1 kWh a week. There is also a display of electric blankets in various sizes and colours.

Webb's Crystal Glass Co., Ltd. (Earls Court R 14).—Crystal and opal glass globes and bowls for street, industrial and domestic lighting.

Westinghouse Brake & Signal Co., Ltd. (H 21).—Exhibits demonstrate the trend in design towards smaller and lighter components particularly for television receivers. The new "36EHT" rectifiers are housed in an insulated tube of only $\frac{7}{16}$ in. diameter. The new "Photector" photo-electric cell of the barrier-layer or rectifier type is designed for use in exposure meters.

Whiteley Electrical Radio Co., Ltd. (H 45).—Besides loudspeakers, transformers, chokes, valveholders, switches, etc., there is a special display of radar equipment and radio-sondes.

Woden Transformer Co., Ltd. (H 50).—Auto-transformers are among a comprehensive display of transformers which includes types for industry as well as for radio.

Woodmet, Ltd. (K 208).—Electrical fittings.

Lamp Packing

IN order to reduce the shipping space of lamps, a new type of pack has been developed, which is moulded from pulp to the natural shape of the lamp. This packing is made in two sections, divided either along the axis of the lamp or across the bulb, the two halves being joined by means of a taper fit. If necessary, caps can be left exposed to permit testing with the lamp still in the container. For fluorescent lamps the packing consists of a straight tube, the lamp being held in position by two wires situated in slits at each end. Printing on containers may be in one, two or three colours. It is claimed by the manufacturers, Formpac's, Ltd., 29, Euston Road, London, N.W.1, that this method of packing lowers labour costs and reduces shipping space by about a third.

PERSONAL and SOCIAL

News of Men and Women of the Industry

AT the meeting of the Institution of Electrical Engineers held on 22nd April the president, Mr. P. Good, presented certificates of honorary membership of the Institution to **Colonel Sir Thomas F. Purves,** O.B.E., past-president, and **Sir John H. D. Cunningham,** G.C.B., M.V.O. The president also presented to **Professor M. L. E. Oliphant,** F.R.S., the Faraday Medal, which the Council had awarded to him for his distinguished work in nuclear physics, and his original discoveries in the physical sciences, particularly in the realm of electromagnetic oscillations, their production, study and use.

Mr. F. J. Erroll, M.A., A.M.I.E.E., M.P., has been appointed to the board of Richard Johnson & Nephew, Ltd. Mr. Erroll obtained an honours degree in the Mechanical Sciences Tripos at Cambridge in 1935. He served an engineering apprenticeship with Metropolitan-Vickers, and was elected Conservative M.P. for Altrincham and Sale in 1945. Mr. Erroll is a regular contributor of Parliamentary articles to our pages.

Mr. F. J. Erroll

Mr. C. H. Tritton, station superintendent at the Maidstone Corporation electricity works for the past twenty-two years, retired on 31st March. He was presented with a vacuum cleaner by Mr. E. E. Hoadley, chief engineer, on behalf of the staff and workmen. Mr. Tritton was a foundation member of the Electrical Power Engineers' Association. He was a member of the National Executive Council and the National Joint Board for the Electricity Supply Industry and was chairman of the No. 9 District Joint Board.

Mr. J. N. R. Perks, M.A., M.I.E.E., has been appointed head of the Public Utilities Branch, Military Government of Berlin. He succeeds **Mr. R. H. S. Piercy,** who was recently appointed assistant commercial manager to the British Electricity Authority.

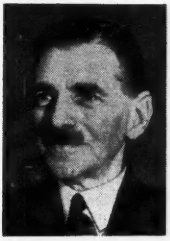
Mr. E. Bolton King, formerly managing director of the Oxford Instruments Co. and during the war a member of the Ministry of Supply rocket team, has been appointed director of the Science Department of the British Council.

Mr. F. C. Fuke, M.I.E.E., has resigned his positions of chief electrical engineer and sales manager of British Mechanical Productions, Ltd., and sales director of the General Accessories Co., Ltd., and has commenced business on his own account as a consulting engineer and manufacturers' agent. At the request of the above companies, Mr. Fuke, who is chairman of the B.E.A.M.A., Accessories Section, will continue to represent them on B.E.A.M.A., B.S.I., and other trade and technical committees. For the time being he will operate from his home address, " Driftway," St. Mary's Road, Leatherhead, Surrey (telephone, Leatherhead 3217).

Mr. H. A. Matthey, A.M.I.E.E., assistant installation and meter superintendent in the Barking district of the N.E. Sub-area of the London Electricity Board, has been appointed sales and development engineer to the Gibraltar City Electricity Department. Mr. Matthey was previously assistant consumers' engineer at Islington.

Mr. Horace A. Deacon has been appointed managing director of Cryselco, Ltd. Mr. Deacon joined the company in 1919, and is well-known in the industry as sales manager, and latterly, director and general manager of the company.

Mr. F. C. Nicholls retired at the end of March from the General Electric Co., Ltd., after fifty-six years' continuous service. Starting in the counting house in 1892, he spent twelve years in the various sales departments at head office. Then followed nearly twenty-five years during which he travelled for the company in Manchester, the West Riding and the London West P.O. District. For the last twenty years he has been in the Business Development Department and has specialized in the design and installation of church lighting in cathedrals and churches.



Mr. F. C. Nicholls

Mr. W. H. Bowman, M.I.MECH.E., has been appointed technical director of Reynolds Light Alloys, Ltd., Reynolds Rolling Mills Ltd., and the South Wales Aluminium Co., Ltd., subsidiaries of Tube Investments, Ltd. **Mr. E. G. Snelus** has been appointed sales manager of Reynolds Light Alloys, Ltd., and Reynolds Rolling Mills, Ltd.

For the past ten years resident chief electrical engineer with Pilkington Bros., Ltd., Kirk Sandall, **Mr. F. A. Richmond** has been appointed chief engineer with Beralt Tin & Wolfram Co., Ltd., Fundoa, Portugal.

A framed address placing on record the appreciation of members of the Midland Electric Corporation Circle for what has been done for them by the Midland Electric Corporation, was

presented to **Mr. C. Heathcock** at the annual dinner of the Circle at Dudley Port.

On Monday last the British Electricity Authority gave a dinner at the Dorchester Hotel in honour of the Electricity Commission. The party included the chairman (**Lord Citrine**), members and senior officers of the Authority with the Commissioners and their senior officers. Sir Cyril Hurcomb was a guest. The occasion was informal but Lord Citrine paid a warm tribute to the work of the Commission and its influence on the destiny of electricity supply. **Sir Cyril Hurcomb** and **Sir John Kennedy** expressed their appreciation.

Mr. P. G. Campling was presented on 21st April with an inscribed silver entrée dish by the chief officials of the Bedford Corporation upon his relinquishing the position of chief electrical engineer at Bedford to become a sub-area manager with the Eastern Electricity Board.

On 3rd April the G.E.C. and Lamson Paragon netball teams contested the final for the Oldbury Cup in the London Business Houses Amateur Sports Association Netball section knock-out competition. The G.E.C. team won 17-10. To celebrate the victory the company is entertaining the Netball Club to dinner at the Trocadero and afterwards to a show at the Hippodrome.

Obituary

Sir William Reavell.—We regret to report the death, at Ipswich, on 25th April, of Sir William Reavell, founder and managing director of Reavell & Co., Ltd. Sir William, who was eighty-two, received his technical training at Armstrong College, Newcastle, and the City and Guilds of London College and took up marine engineering. After periods as manager of the marine department of Babcock & Wilcox, Ltd., and general manager of Peter Brotherhood, Ltd., he commenced business on his own account in 1898. Sir William was a past-president of the Institution of Mechanical Engineers and of the British Engineers' Association and a past-chairman of the general council of the British Standards Institution.

Electricity Appointments

FURTHER appointments made by the **South West Scotland Electricity Board** are as follows:—*Chief commercial officer*, Mr. J. Gogan, M.I.E.E. (sales manager, Clyde Valley E. P. Co.). *Sub-area managers*—Glasgow, Mr. A. Kelso, M.I.E.E. (engineer and manager, Harrogate); Clyde, Mr. D. Ross, A.M.I.E.E. (engineer and manager, Paisley); Lanarkshire, Mr. D. Smith, B.SC., A.R.T.C., A.M.I.E.E. (distribution engineer, Clyde Valley E. P. Co.); Ayrshire, Mr. A. E. Roots, M.I.E.E. (engineer and manager, Dumfries Corporation); Dumfries and Galloway, Mr. W. H. Wills, M.I.E.E. (acting engineer and manager, Dumfries County Council undertaking).

The **Eastern Electricity Board** has appointed Mr. R. H. M. Barkham, B.SC., A.M.I.E.E. (Grantham manager, Urban Electric Supply Co.) as manager of its No. 3 Sub-area, and Mr. H. J. Wright, M.ENG., M.I.E.E., M.I.MECH.E. (assistant general manager, East Anglian E.S. Co. and deputy to the general manager of the B.C. & H. Electricity Co. and Newmarket E.L. Co.) as manager of its No. 6 Sub-area.

The **South Western Division** of the B.E.A. has appointed Mr. D. P. Farrant, as station superintendent at Portishead power station. Mr. Farrant was previously operation engineer at the same station.

I.M.E.A. Convention

Programme Details

MEMBERS of the Incorporated Municipal Electrical Association have now received the official programme for the Convention at Eastbourne of which the following is a brief outline:—

Monday, 7th June: Issue of badges; opening of exhibition; reception by the president (Mr. J. Eccles) and Mrs. Eccles.

Tuesday, 8th June: Civic welcome by the Mayor of Eastbourne; presidential address; paper by Mr. H. G. Bell and Dr. D. M. Smith on "Gas Turbines for Public Electricity Supply"; reception by the Mayor and Mayoress, and dancing.

Wednesday, 9th June: Motor coach tours to Canterbury, Chichester, Tunbridge Wells and Hastings.

Thursday, 10th June: Paper by Mr. R. C. Golding on "Reorganization for Efficiency on a Regional Basis"; E.A.W. luncheon; annual dinner (principal guest, Mr. Hugh Gaitskell); dance.

Friday, 11th June: "Symbolic ceremony for transferring the responsibility for future Conventions to the British Electricity Authority"; address by Lord Citrine.

INFORMATION DEPARTMENT

THE extensive records of our Information Department enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following :—

"UTON" or "UCON" pillar-type controller pattern ammeters.

"BOLDSWORTH" fractional h.p. motors (Burnley ?).

General inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

COMMERCE and INDUSTRY

Electricity Boards' Financial Year. Radio Component Production.

THE Electricity (Financial Years) Regulations, 1948 (S.I. 1948 No. 747, H.M. Stationery Office, 1d.) made by the Ministry of Fuel and Power provide that the financial year of any Electricity Board (other than the North of Scotland Board) shall end on 31st March.

Electricity Loans

A total of £128,252,295 in loans was sanctioned by the Electricity Commissioners for the year ended 31st March to public electricity authorities. This compares with £43,978,594 for 1946-47, £37,652,375 for 1945-46 and £28,337,818 for 1944-45. The largest items were for generating plant (£65,276,782), generating buildings(£36,722,402), mains and services (£13,050,541), and distribution plant (£8,302,921).

B.E.A. Advertising

It is announced that the British Electricity Authority proposes to commence national advertising on a moderate scale in daily and Sunday newspapers and weekly magazines, supported for an initial period by 16-sheet posters in various centres. Simple window displays will be available for electricity showrooms. The monthly advertisement will be a cartoon strip introducing the "Switch Family Robinson" and it will deal with electricity from the "national angle."

Lewisham Rating Appeal

An appeal by the South Metropolitan Electric Light & Power Co., Ltd., against the decision of the Lewisham Assessment Committee was recently allowed by the Rating Appeals Committee of London Quarter Sessions with costs, the rateable value being reduced from £23,319 to £5,550.

Mullard Company's Change of Name

The Mullard Wireless Service Co., Ltd., has changed its name to Mullard Electronic Products, Ltd. This change has been made necessary by the expansion of the company's activities from that of the purely wireless field into other branches of electronics—particularly those with applications in industry, science and communications.

Belgian Periodical Revived

It is announced that publication of the technical periodical formerly known as the "A.C.E.C. Review" has been resumed. It is printed in French, is now in a slightly different form and has changed its name to "Charleroi-Jeumont Review," since it records the technical activities of the two well-known Belgian manufacturing concerns indicated by its new name. Copies are available to engineers of standing in the United Kingdom upon application to Mr. W. H. Wadmore, British manager, A.C.E.C., 56, Victoria Street, London, S.W.1.

Improved Tower Wagon

The accompanying illustration shows one of two tower wagons supplied to Blackpool Corporation Transport Department by the Eagle

New design of tower wagon supplied to Blackpool Transport Department

Engineering Co., Ltd., for overhead tramway maintenance and street lighting. The tower extends to 25 ft (7·6 m) and has a closed height of 13 ft 6 in. A power hydraulic ram elevates the tower and the workshop is provided with a bench and vice and various tool lockers, linesmen's seats, etc. The chassis is the Karrier CK.3 model.

Quality Control

B.S.600, dealing with the application of statistical methods to industrial standardization and quality control, has now been reprinted. This standard explains why a statistical technique is needed for the solution of problems of specification, standardization and routine process control. Specimen problems are discussed to introduce the common statistical measures. Questions of sampling are examined and guidance on sampling is given. Methods of controlling the quality of a product are described, either by examining samples taken from batches or consignments or by routine testing in the

course of manufacture. It shows how both methods can form the basis of the use of certification marks and includes statistical methods needed in industrial investigation. The publication (price 12s. 6d.) can be obtained from the British Standards Institution, 24, Victoria Street, London, S.W.1, or sales agents overseas.

Textile Industry Electrification

The importance at the present time of textiles in the export drive gives added interest to a special display which the English Electric Co.,

English Electric textile machinery display at Blackburn

Ltd., has arranged in its showroom window at 32a, Preston New Road, Blackburn. The company undertakes schemes for the complete electrification of mills and factories, and the display draws attention to the important part played by electrical equipment in the efficient running of textile mills.

Radio Component Industry

The annual report of the Radio Component Manufacturers' Federation, presented at the annual general meeting at Grosvenor House, Park Lane, W.1, on 22nd April, states that the industry during the past year produced over 250 million major components for the radio industry alone, in addition to many millions of smaller articles and components produced for the associated electrical, electronic and telecommunication industries. The radio production programme for the current year (1948-49), agreed between the Ministry of Supply and the Radio Industry Council, provides for the construction of 1,400,000 sets for the home market and 400,000 for export. Provisional agreement was also reached for the production of 100,000 to 120,000 television receivers and up to 300,000 car radios, the total programme providing for the construction of 2,220,000 sets. This compares with an overall production during 1947 of approximately 2,070,000 sets, and since a bigger proportion of the 1948-49 sets will be larger units, the programme involves an increase of nearly 10 per cent in actual production. These figures represent licensed production which the Ministry is prepared to sanction for the radio industry.

So far as the component manufacturer is concerned this programme represents something less than two-thirds of his total radio commitments. The rest will be absorbed by direct export and by the requirements of other sections of the radio and electronic industry. Altogether between 275 million and 300 million principal components will have to be produced. In addition the rapidly expanding scientific instrument industry is constantly calling for ever-larger supplies of components. The amateur market, largely supplied from the United States before the war, has grown ten-fold in size and to-day represents a potential market of £250,000 worth of components.

The Council states that the prospects for 1948 so far as the overall supplies of raw materials are concerned are more promising than for some time. The material which still gives cause for anxiety is steel.

Accessories Company's Convention

A West Country sales convention was held by the General Accessories Co., Ltd., at the Grand Hotel, Bristol, on 13th and 14th April, at which wholesalers, agents and representatives of the company in the West of England and Wales attended to meet the design, production and sale personnel. At a dinner held in the evening of the first day, Mr. Harper-Bill, resident director, introduced Mr. A. P. G. Walters, joint managing director of the General Accessories Co., Ltd., and British Mechanical Productions, Ltd., which were amalgamated on 1st April, who outlined their future policy.

American Plant Price Cuts

The Westinghouse Electric Corporation on 23rd April announced price cuts averaging 5 per cent on electrical products used in the distribution of electric power.—*Reuter* (Pittsburg).

Miniature Motors

New models of the miniature battery driven motors named "Electrotors," which are built on unorthodox lines by Rev Motors, Ltd., were demonstrated recently in London. An addition to the range of sizes available is the type-250, which is $\frac{7}{8}$ in. (2·22 cm) in length as well as diameter. It is thus of the same diameter as the type-240, but half as long again; although only one dimension has been increased by 50 per cent, the armature increase is 100 per cent so making it more powerful without increasing the consumption. This model is furnished with self-lubricating phosphor bronze bearings and the fixing clips have been replaced by two bolts with nuts which also serve as terminals.

Since these unconventional machines were announced (*Electrical Review*, 25th April, 1947) the shape of their brushes has been changed and their bobbins are now injection moulded instead of being capstan turned from ebony rod, to prevent the spindle from working loose and avoiding damage to the windings when the armature is forced on to the bobbin, while a better way of preventing the armature becoming dislodged has been devised.

Sales arrangements have been made in South Africa and Canada and manufacture is contemplated in the United States and Sweden by local concerns.

Codes of Practice Committee

The Third Report of the Codes of Practice Committee for Civil Engineering, Public Works and Building, published by the Stationery Office at 9d. net, covers the three years 1943-46 during which the procedure for the preparation of these codes was evolved. Particulars are given of the codes that have been drafted by each of the collaborating professional institutions and issued for comment, and also of the work yet to be accomplished. A list of members of the Codes of Practice Committee, Drafting Committees and Panels is included.

Trade Announcements

The telephone number of Mr. E. C. Moxon, 115, Warwick Road, Birmingham, 27, sales engineer for the Midland area of **Hopkinson Electric Co., Ltd.**, is Acocks Green 2986.

Musgrave & Co., Ltd., heating and ventilating engineers of Belfast, have opened branch offices at 89a, Clayton Street, Newcastle-on-Tyne, and Mr. W. J. Adams has been appointed manager.

Advice to Contractors

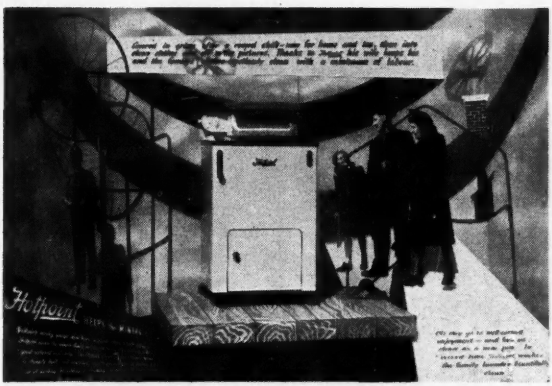
Electrical contractors occasionally find themselves in difficulties as the result of being placed in the position of sub-contractors to builders. In a letter to his members Mr. L. C. Penwill, director of the Electrical Contractors' Association, advises them in accepting work under a form of sub-contract to insist upon the conditions which are contained in the Standard Form of Sub-Contract which was issued some time ago under the auspices of the National Federation of Building Trades Employers and the National Federation of Specialists and Sub-Contractors, with the recommendation of the R.I.B.A. They should also guard against any clause which makes the payment dependent upon the receipt of the money by the main contractor and to take action immediately the main contractor is in arrear with any payments and so ensure early payment, rather than allow the risk to be increased by carrying out further work.

Hire of Contractors' Plant

The Control of Rates of Hire of Plant Order, 1948 (S.I. 1948 No. 792), consolidates with amendments the Orders relating to the control of rates of hire of contractors' plant.

Washing Machine Window Display

The accompanying picture shows a window display recently installed in the Crown House, Aldwych, showrooms of the Hotpoint Electric Appliance Co., Ltd., depicting the use of the Hotpoint electric cabinet washing and wringing machine in domestic situations in mining areas.



Hotpoint window display

Electricity Company Loses Test Case

An important judgment affecting industrial and other concerns which take deliveries of coal through factors was given at the Birmingham County Court on 21st April by Judge Forbes. The case was one in which the Leicestershire and Warwickshire Electric Light & Power Co. was sued by Alexander Comley, Ltd., coal factors, for £4 10s. 9d. in respect of the delivery to them of 100 tons of coal in January last year, at a cost of £331 2s. 10d.

The coal was allocated to defendants from the Kingsbury colliery near Tamworth and plaintiffs claimed a factors' margin. Defendants objected to paying a distributors' margin on the ground that the colliery was directed to supply the coal to them.

Finding for the plaintiffs for the amount claimed, with costs, Judge Forbes said it was loose language to describe them as agents of the colliery. They were distributors acting as principals.

The defendants were made aware of this and accepted the coal on those terms. They must be held to have consented to deal with plaintiffs as factors; to have known that a distribution margin would be charged; and to have contracted on that basis. Leave to appeal was under discussion.

Current Rating of Cables

The British Electrical and Allied Industries Research Association announces that Report F/T128, which has been out of stock for some time, has been reprinted in view of the demand for it. This report contains tables of current ratings of British Standard cables for voltages up to 20 kV, with explanatory notes, including an appendix on methods of determining thermal resistivity of ground.

E.W.F. Annual Meeting

The thirty-third annual general meeting and luncheon of the Electrical Wholesalers' Federation was held at the Savoy Hotel on 22nd April, and was presided over by the president, Mr. A. C. Baker. About 130 members attended, which number constituted a record in the Federation's history. The collection made on behalf of the Electrical Industries Benevolent Association realized £108.

Simplex London Showrooms

THE London headquarters of Simplex Electric Co., Ltd., at 217-219, Tottenham Court Road, W.1, which were severely damaged by enemy action during the war, have now been completely reconstructed.

The new premises, designed by Mr. Clive Pascall, architect, are intended to serve as a complete service centre for London and the Home Counties and will also form a central point for the control of sub-depots situated at Luton, Croydon, Brighton and Southampton. Special attention is being paid to the needs of overseas visitors.

Exterior of the new Simplex London showrooms

General view of the ground floor showroom

The showrooms are arranged in sections covering industrial, commercial and domestic electricity applications and are likely to prove of interest to electricity supply engineers, electrical installation contractors and the various Ministries responsible for reconstruction.

On the ground floor there is an excellent example of planned kitchen development illustrating the built-in technique for electric water heating, electric cooking and ancillary equipment. On this floor there is also a display of all types of switch and fuse gear, conduit and conduit fittings and switch panels. There is also a large trade counter. Other displays include panels showing Mersey cables and special purpose switches manufactured by A. P. Lundberg & Sons, Ltd.

In the basement there are examples of Simplex street lighting equipment, commercial and industrial lighting, while a further showroom displays heavy duty cooking equipment with examples of "Creda" cookers used by the catering and hotel trade and works canteens. Architects, engineers and contractors will find of particular interest the Simplex switch panels installed to control the lighting installations.

Birmingham Supply

Commemoration of Transfer

TO commemorate the vesting of the Birmingham Electric Supply Department in the British Electricity Authority and the Midlands Electricity Board a dinner was held on Tuesday last week at the Midland Hotel, Birmingham, Councillor J. M. Morrin, chairman of the Electric Supply Committee, presiding.

Proposing the toast of "The City of Birmingham," Sir John Kennedy, chairman of the Electricity Commission, said that the electricity undertaking had been outstandingly successful. Hams Hall power station was the most efficient economically and thermally in the country and he paid a high tribute to the work of Mr. F. W. Lawton, the city's electrical engineer, who has now been appointed Divisional Controller, Midlands Division, British Electricity Authority.

The Lord Mayor of Birmingham, Councillor J. C. Burman, J.P., responded.

Mr. Frank Forrest, former Birmingham city electrical engineer and now a member of the South Western Electricity Board, proposing the toast of the B.E.A., congratulated Lord Citrine, its chairman, on the smooth way in which the transition of the electricity supply industry to national ownership had taken place. It was a tragedy that it was necessary to damp down the present enthusiasm for electricity. He hoped that with electricity and transport both nationalized the electrification of the Birmingham suburban railways would be undertaken.

In reply, Lord Citrine said that the smoothness of the transfer could not have taken place without an immeasurable amount of goodwill.

Proposing the toast of the Midlands Electricity Board, Councillor Morrin said that the Birmingham undertaking which it was taking over was the largest municipal undertaking in the country. Responding, Alderman W. S. Lewis, chairman of the Midlands Board, said that Birmingham was not handing over the paying proposition that might have been thought. The undertaking was faced with a deficit of £500,000 next year.

Mr. D. H. Kendon, deputy chairman of the Midlands Board, proposed the toast of the Birmingham Electric Supply Department, and to Mr. Lawton, who replied, the Lord Mayor presented an illuminated address recording the Department's appreciation of his services.

Goods-Yard Lighting

New Mercury-Vapour Installation

AS the result of experiments begun in 1946 the relighting is now under way of the goods and marshalling yards at King's Cross of the British Railways, Eastern and North Eastern Regions. Hitherto such installations have consisted of 200- to 500-W filament lamps in enamelled iron dispersive reflectors mounted on wood poles, or 500 to 1,000-W horizontal projector lanterns on poles of twice the height.

New lighting installation at the King's Cross marshalling yards

Neither method has been completely satisfactory; the first largely on account of unevenness and the second because of glare and contrasts.

At the King's Cross yard materially improved illumination has resulted from the use of far fewer, but much taller, poles so spaced as to provide good background lighting generally, with short poles only at positions where intense local light is needed. The wood poles (fortunately available) are 60 ft long and mostly spaced 300 ft apart. They carry 400-W mercury vapour lamps in Holophane "Bi-way" refractor lanterns arranged in clusters of three each (50 ft mounting height) except in certain positions near signals where the same type of lanterns contain filament lamps.

Three steel-rope winches for lowering the lanterns are mounted to the butt of each pole, together with two cast-iron boxes containing the control gear and switches. The general effect is similar to that of full moonlight, the average illumination at ground level being 0·25 lumen per sq ft with a main beam angle of 75 deg.

The power and lighting section of the Electrical Engineer's Department is carrying out the installation.

Cold-Welding Aluminium

THE means of cold welding aluminium and some of its alloys recently developed in the research laboratories of the General Electric Co., Ltd., indicates that such unions can be reliable provided the surfaces are suitably pretreated. Some ductile metals can be welded by pressure alone when applied by specially designed dies mounted in a suitable tool or hand-press but the oxide film must first be removed so that the surfaces can be placed in intimate contact between the dies. A substantial part of the G.E.C. investigation has been concerned with determining the best means of performing this operation. Provided the surfaces are kept clean, satisfactory welds can be made within 24 hours of removing the oxide; cleanliness is extremely critical, even contamination by handling will prevent a weld from forming.

The second proviso is that the pressure must be applied over a comparatively narrow strip and in such a manner that metal can flow away from the weld at both sides.

Considerable displacement of metal is necessary, but not so much as will weaken the union mechanically by too much reduction of thickness. Therefore minimum closure of presses must be predetermined.

Three kinds of dies have been evolved for long straight welds (strip and sheet) and for ring welds (disc-like specimens) and for making tube. In the last mentioned case the metal is displaced outwardly and can be trimmed off the tube by a cutting machine. The simpler dies can be mounted in hand tools of the pliers type instead of a press for welding the thinner gauges of metal. By the use of special dies, whose two parts are of different surface areas to allow for the differing ductility, it is possible to cold-weld copper to aluminium for making electrical connections.

I.E.E. Students

SEVERAL subjects were discussed at last month's meeting of the London Students' Section of the Institution of Electrical Engineers.

"Trams versus Trolley-buses," introduced by Mr. A. H. Willoughby, provoked a lively discussion in which many speakers pointed out that London trams should not be used to illustrate a case for abolition because they were not a good example of modern construction. The Blackpool Corporation tram system was as good as any a critical public could desire. The trolley-bus could only be justified economically in densely populated traffic areas, owing to the high initial cost of the line construction.

"Will frequency modulation supersede amplitude modulation for broadcasting?" asked Mr. D. R. A. Mollis, and a theory was expounded about the production of musical sounds. Frequencies outside the audio-frequency range were produced by the instruments which combined with those in the audio-frequency range, producing a combined frequency. The F.M. system was better able to reproduce these. While the F.M. system was more desirable, much opposition would be encountered from the general public because of the high cost of the change-over. It was thought that F.M. would be at first confined to transmitters for short distances.

The question "Should all practical experience be gained with one employer or several?" was introduced by Mr. D. A. Dewison. There was much to be said in favour of staying with the large firm which manufactured a variety of electrical equipment, because all-round experience was gained. On the other hand, the man who moved from one firm to another gained experience of different methods of production and also gained psychologically in that he was better able to judge his own value against backgrounds. Many engineers now obtaining practical experience had "lost" several years during the war and, therefore, felt that they could spend less time in completing their practical training.

The subject introduced by Mr. F. E. M. Hardy was "Should æsthetic considerations against any electrical project outweigh those of economy and efficiency?" Opinion was that the need to produce more electricity was more urgent than the preservation of "nice views."

Institute of Management

THE inaugural meeting of the British Institute of Management was held in London on 21st April, and was presided over by Sir Charles Renold (chairman), who said that the preliminary work of organization was well advanced and the next stage was to enlist support. The movement would be developed along three main lines. First, the compilation of knowledge about management, the promotion of education and training facilities, and third, the propagation of knowledge about management and the stimulation of interest in the subject. The Institute planned to promote management associations in every town throughout the country.

Sir Stafford Cripps said that the Government regarded it of importance that the B.I.M. should be wholly free from all Governmental interference in its work. Although the Government had selected the first Council, once the Institute was established the Council would become an elected body. While the Government had helped with initial finance, it was important that the Institute should become self-supporting at the earliest possible moment and it could only do this on the basis of the widest possible membership.

Sir Frederick Bain, president of the F.B.I., and Miss Florence Hancock, chairman of the Trades Union Congress also spoke in support of the Institute.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Associated Electrical Industries, Ltd., reports a profit on trading for the year ended 31st December last of £1,933,210, as compared with £1,062,915 for the preceding year, which with dividends and debenture interest from subsidiary companies of £1,272,599 and other income, makes £3,327,000 (against £2,281,654), and after deducting depreciation, directors' fees, amounts set aside as reserves, other provisions, profits tax and income tax, there is a net profit of £1,162,008 (against £1,096,046). General reserve receives £547,475, and as already announced the final ordinary dividend is 7½ per cent with a bonus of 2½ per cent, again making 15 per cent for the year. The balance carried forward is £411,792 (against £344,400 brought in).

The consolidated accounts show a total trading profit of the group of £4,454,458 (against £3,168,633), which with other revenue makes £4,641,453, and a net profit of £1,518,977 (against £1,492,015). General reserves receive £1,003,224, proportion of surplus and reserves attributable to outside shareholders £5,166, and dividends £618,899, leaving £1,096,661 (£1,028,498) to be carried forward.

The Brush Electrical Engineering Co., Ltd.—The annual meeting was held on 20th April, Sir Ronald Matthews (chairman) presiding. In his statement issued to stockholders Sir Ronald says that further provision has been made towards the estimated modification costs of Ljungström turbines, bringing the total to £150,000, approximately 50 per cent of the total cost which will fall on the company in connection with the modification programme. In spite of the Government's reduction in the ordering of generating plant for this country, the company has already secured substantial orders in 1948. The electrical division and electrical machine department have full order books for more than a year ahead. During 1948 production will be started of flame-proof motors for mines, for which the company has substantial orders. With regard to diesel electric traction, in addition to the main line shunter which has been on test for several months further similar shunters have been shipped abroad. Negotiations are still proceeding for the acquisition on a share exchange basis, of Mirrlees, Bickerton & Day, Ltd., and J. & H. McLaren, Ltd. The prospects for 1948 are bright and the company has started the year with an order book of over £7,000,000.

The British Oxygen Co., Ltd., reports a profit for 1947, including dividends from subsidiary companies, of £2,256,127 (against £1,596,599 for 1946), and other income of £22,532 (£4,935 and £150,000 E.P.T. adjustment). The net profit was £721,583 (£668,858). The final ordinary dividend of 12 per cent maintains the total at 20 per cent for the year, and £123,693 (£100,389) is carried forward.

Notice is given of a resolution to be proposed at the annual general meeting to increase the authorized share capital from £6,000,000 to £10,000,000 by the creation of 4,000,000 £1 shares. No immediate issue is contemplated.

The Telegraph Construction & Maintenance Co., Ltd., reports a trading profit for 1947, including share of net profit of associated company, of £159,912, as compared with £160,736 for 1946, and a net profit of £54,894 (against £82,023), to which is added £68,709 brought in, making £123,603 available. Of this £20,000 is set aside for contingencies reserve, and it is proposed to pay a final dividend of 5 per cent, making 10 per cent, less tax, for the year (unchanged). The balance carried forward is £60,613.

Laurence, Scott & Electromotors, Ltd., report a profit on trading for 1947 of £193,515, as compared with £120,550 for 1946. The dividend on the " A " and " B " ordinary for the year is unchanged at 12½ per cent.

The British Thermostat Co., Ltd., reports a profit for 1947, after tax, of £91,284, as compared with £46,193 for 1946. The final dividend is 11 per cent, plus a bonus of 5 per cent, maintaining the distribution for the year at 23½ per cent.

C. A. Parsons & Co., Ltd., show a net profit for 1947 of £139,597, as compared with £131,418 for the preceding year. The final dividend is 7½ per cent, again making 12½ per cent for the year.

Kerry's (Great Britain), Ltd., propose to pay a final dividend of 7½ per cent on the enlarged ordinary capital, making 12½ per cent for the ten months ended 31st December last (against 15 per cent for the preceding twelve months). The net profit, including dividends receivable from subsidiaries, was £200,970 (£239,525).

The Telegraph Condenser Co., Ltd., is maintaining its ordinary dividend at 15 per cent by the final distribution of 10 per cent. The trading profit rose from £98,708 to £191,724.

The Pressed Steel Co., Ltd., announces a final dividend of 20 per cent, again making 30 per cent for the year. Net profit was £51,985 higher at £305,990.

W. Canning & Co., Ltd., in their accounts for 1947 show a trading profit of £477,375 (against £320,304 for 1946) and a net profit of £181,442 (£117,718). The ordinary dividend and bonus again total 27½ per cent.

Holophane, Ltd., have declared an unchanged interim dividend of 7½ per cent.

STOCKS AND SHARES

THE majority of Stock Exchange members say that their markets are firm but idle. The nationalization stocks, Transport and Electricity, have recovered substantially from the recent lowest: they are gradually making their way into favour with the investor who wants dated stocks standing under par. If the Government were to make the stocks eligible for payment for death duties at 100, or accept them in connection with the capital levy, a powerful impetus to the demand would be provided. The industrial groups hold their prices, and attract a good deal of unemployed money, although caution continues to prevail.

Dividend Declarations

Among other recent dividend declarations is the 12½ per cent payment by C. A. Parsons, whose £1 shares are quoted at 65s. to yield £3 17s. per cent. Parkinson & Cowan state specifically that the rate of 5 per cent is being maintained in conformity with the Government's request, although the increase in profits, which represent earnings of 15 per cent, would have permitted something better. The £1 shares stand at 19s. 6d. British Thermostat is also paying the same dividend as before, 23½ per cent, including a bonus of 5 per cent, despite a much larger profit. The 5s. shares at 23s. 9d. show a return of about 5 per cent.

Increased Profits

Good figures accompanied last week's announcement of dividends, at the same rate as last year's, by Allen West and Laurence, Scott & Electromotors. Allen West's net profit of £106,000 indicates that the 10 per cent payment (including 2½ per cent bonus) is covered more than three times by the earnings available for the £609,000 capital, all of which is in ordinary stock. Laurence, Scott's trading profit of £194,000, after deduction of £33,000 for profits tax, compares with last year's figure of £121,000, including £28,000 E.P.T. recovered. Ignoring profits taxes, the trading result appears to be over twice the 1946 level. Both companies' 5s. shares are quoted at about 11s. Yields work out at 4½ per cent on Allen Wests, and over 5½ per cent on Laurence, Scotts. The latter receive 12½ per cent on both the "A" and "B" ordinary stocks: the 4½ per cent preference are on offer at 21s. 6d., yielding 1s. under £4 per cent.

Changes in Price

The chief changes in prices over the past week have been in Indian industrials, Calcutta Electrics at 47s. 6d. being 5s. up, while Calcutta Trams at 39s. 6d. show a gain of 9s. South Africans are better, too, Victoria Falls at 7⅞ having risen 5s. Cable & Wireless ordinary advanced to 202½, a rise of 9 points. In the industrial group, Ward & Goldstone hardened to 60s., Arons to 56s. 3d. Walsall Conduits at 60s. 6d. are 4s. higher. Gains have been secured by Electric Construction 51s. 3d., De la Rue 44s. 6d., Brush 7s. 6d., and Automatic Telephone 63s. 9d. The radio group is dull, with the exception of Electric & Musical Industries now up to 17s. 9d. Decca Records at 25s. are 3s. 9d. down; Radio-Television are easier at 6s. 6d.; Cossors fell back to 11s.; Scophony to 2s. 6d.

Reyrolle Reflections

Mr. George Wansborough, at the Reyrolle annual meeting, showed that, out of every 20s. for sales, there remained, after wages, materials, taxes, etc., a balance of only 1s. 3d. for dividends and reserves. Of this remainder, 5¼d. was paid out to shareholders. The ordinary distribution of 12½ per cent represented about 3 per cent on the capital employed in the business, even on the basis of book values. Comparing present incomes with the pre-war position, the chairman calculated, allowing for taxation, that stockholders had lost about a quarter of their net income while the earnings of the average employee had more than doubled. The company's £1 shares have risen to 65s. 9d., at which the yield is £3 16s. per cent.

Telegraph Construction

Telegraph Construction & Maintenance £1 shares recovered to 48s. 6d. ex dividend on the appearance of the full accounts. These show that higher taxation was chiefly responsible for the smaller net profit disclosed in the preliminary figures issued at the time of the dividend declaration. Profits before tax are now shown to be little different from those of 1946. The impressive balance sheet includes for the first time the 67,000 Johnson & Phillips shares acquired a year ago in exchange for 100,000 Telegraph Construction shares, as part of the general agreement for closer co-operation between the two companies. The general strength of the position is recognized in a yield of just over 4 per cent on the shares. Earnings work out at 12¾ per cent on the £782,000 capital, which is all in ordinary shares.

Telephone Shares

Reference was made here last week to the popularity of telephone shares mentioned by the chairman of Ericssons at the annual meeting. Both Ericssons and Automatic Telephone ordinary shares return under 4 per cent on the money. The relatively larger yield of 4½ per cent on Telephone Manufacturing 5s. shares at 10s. still reflects the big fall of profits during the reconversion period of 1946, when the 9 per cent dividend was barely covered, despite a large credit for E.P.T. In the annual report issued last August, however, the chairman referred to an order book for £1,800,000. Siemens £1 ordinary are quoted at 35s. to yield £4 5s. 9d. per cent: the dividend for 1947 is due in June.

Overseas Electrical Trade

Exports in First Quarter Total £23·1 Million

SECOND only to January's record amount, the value of exports of electrical equipment in March brought the aggregate for the first quarter of the year up to £23·1 million. This was more than for the whole of 1938. The steady expansion over the past year can be seen from the following quarterly figures since the beginning of 1947 (in £ million):—15·7, 16·6, 20·8 and 21·2.

Because of the Easter holidays, last month contained only 25 working days, so that the total of £7·75 million is equal to a daily rate of £0·31 million. In January the figure of £8·18 million was achieved in 27 working days, which

Table I.—Electrical Exports and Imports

Class	Exports			Imports		
	March, 1948	March, 1947	Monthly Av., 1938	March, 1948	March, 1947	Monthly Av., 1938
	£	£	£	£	£	£
Telegraph and telephone wires and cables, submarine	2,441	111,210	17,289			
Ditto, not submarine	503,309	113,521	71,803			
Wires and cables, rubber insulated	369,131	321,875	117,533			
Ditto, cotton, silk or artificial silk, insulated	75,720	38,692	†	16,822	3,140	31,246
Ditto, enamel, glass or asbestos insulated	20,372	17,653	†			
Ditto, paper insulated	541,284	168,333	103,457			
Ditto, other	91,068	68,777	49,799			
Commercial radio apparatus	330,977	99,557	28,296	25,676	22,373	58,018
Domestic radio apparatus	243,069	364,754	36,755			
Telegraph, telephone and signalling apparatus	736,734	437,437	242,716	7,546	16,219	9,243
Other radio, etc., apparatus	272,182	206,058	57,848	—	—	—
Radio valves	202,416	147,159	41,272	16,797	15,478	10,893
Electric carbons, furnace	*	*	*	11,475	11,762	4,054
Ditto, other	*	*	*	5,738	3,941	2,301
Electric lamps, not exceeding 24 V	18,713	24,664				
Discharge lamps	29,316	14,218	49,440	9,298	3,636	10,265
Other lamps	97,628	75,338				
Other lighting apparatus	352,616	213,303	48,565	31,054	2,774	38,662
Primary batteries	46,089	29,955	13,572	*	*	*
Accumulators for motor vehicles	163,278	84,639	16,418	*	*	*
Ditto, traction	10,806					
Ditto, radio	5,432	32,995	12,456	*	*	*
Other portable accumulators	20,471					
All other accumulators	43,253	17,358	19,773	*	*	*
Parts and accessories	39,835	38,374	—	*	*	*
Cooking apparatus and elements	144,066	52,783	16,600	*	*	*
Heating apparatus and elements	63,139	137,826	14,064	*	*	*
Other parts and accessories	32,820	18,183	—	*	*	*
Commercial electrical instruments	83,367	76,768	15,878			
House service meters	144,032	65,282	15,791	27,074	13,790	32,057
Other electrical instruments	80,082	36,108	9,612			
Electro-medical apparatus (not X-ray)	26,876	25,996	3,038	*	*	*
X-ray apparatus, tubes and parts	37,695	44,035	4,881	52,175	12,996	9,734
Insulating cloth and tape	42,697	36,976	7,038	*	*	*
Other insulating materials	86,426	61,022	12,305	*	*	*
Unclassified goods and apparatus	347,522	177,123	108,085	31,376	20,411	56,529
Generators, up to 200 kW	271,409	128,422	38,071	*	*	*
Ditto, over 200 kW	132,625	166,524	119,079	*	*	*
Ditto, parts	325,050	199,830	—	*	*	*
Motors, railway and tramway	16,589	15,478	15,977			
Ditto, other, up to ½ h.p.	48,160	26,111	9,001			
Ditto, from ½ to 1 h.p.	42,633	16,853	2,470			
Ditto, from 1 to 250 h.p.	306,647	204,650	96,637	35,756	3,131	26,033
Ditto, over 250 h.p.	69,442	17,115	20,960			
Ditto, parts	48,011	40,883	—			
Converting machinery	3,412	18,103	101,304			
Transformers, including coils	346,149	288,562				
Rectifiers for power house use	27,273	21,627	3,463			
Motor starting and controlling gear	120,586	80,654	50,866	96,491	3,141	14,455
Switchgear and switchboards (not telegraph or telephone)	497,119	485,504	184,533			
Other electrical machinery	38,969	18,462	15,497			
Vacuum cleaners and parts	113,702	199,522	26,662			
Other electrically operated portable appliances	41,453	18,737	10,394	7,805	9,985	24,627
Total	7,754,091	5,305,009	1,829,198	375,083	142,777	328,117

* Not classified separately † Not separately distinguished in 1938.

works out at a little under the rate for March. Goods and apparatus exports last month were valued at £5·3 million, and Table I shows that those of wires and cables were again maintained at a high level, although there has been little export of the submarine type. More than half of the £503,309 worth of telegraph and telephone cable (other than submarine) was sent to foreign countries. While exports of rubber-insulated wires and cables are running at about the same level as last year, there has been a marked rise in paper-insulated types (£541,284 against £168,333 in March last year).

Table II.—Distribution of Exports of Electrical Goods and Apparatus

Destination	March, 1948	March, 1947	Monthly Av., 1938
	£	£	£
Eire	268,610	101,250	37,726
Channel Islands ..	30,334	38,251	12,177
Malta and Gozo ..	5,638	12,451	5,873
Cyprus	29,961	15,669	1,373
Palestine	59,159	46,983	8,426
British West Africa ..	80,220	37,977	12,889
Union of South Africa	546,180	419,256	162,584
Southern Rhodesia	81,463	26,397	9,632
British East Africa ..	106,626	20,032	7,893
India, Pakistan, etc. ..	315,285	563,146	123,789
British Malaya ..	194,537	114,376	32,792
Ceylon	67,810	26,662	15,048
Hong Kong	94,485	37,692	12,939
Australia	359,204	149,567	197,366
New Zealand ..	256,473	165,743	96,225
Canada	80,321	28,899	12,547
British West Indies ..	86,666	59,473	12,954
Anglo-Egyptian Sudan	30,200	30,564	2,989
Other British Countries	99,592	49,325	11,030
Soviet Union ..	23,267	48,787	36,781
Finland	36,429	18,875	5,969
Sweden	145,987	63,376	14,948
Norway	101,647	57,116	12,881
Iceland	5,435	28,700	2,796
Denmark	32,603	69,955	18,907
Poland	21,313	23,194	9,702
Netherlands	122,469	81,559	22,010
Belgium	76,183	79,327	11,208
France	45,322	89,214	16,082
Switzerland ..	35,502	27,984	3,768
Portugal	100,161	63,304	6,512
Spain	63,064	20,560	3,813
Czechoslovakia ..	28,127	44,873	7,205
Yugoslavia	19,643	23,962	1,475
Greece	20,199	42,110	4,926
Turkey	113,446	31,230	7,684
Dutch East Indies ..	28,506	12,582	2,692
Dutch West Indies ..	6,251	1,586	830
Portuguese East Africa	41,702	5,239	6,942
Lebanon	6,912	8,663	—
Egypt	232,718	60,856	13,176
Iraq	89,781	52,042	5,530
Iran	104,541	85,819	16,345
Burma	85,861	21,809	5,337
China	261,269	61,161	4,116
United States of America	26,796	15,236	5,839
Mexico	3,362	11,892	1,466
Colombia	13,971	2,174	845
Venezuela	73,671	20,736	2,936
Chile	21,808	9,057	6,635
Brazil	125,360	84,993	11,164
Uruguay	18,535	9,325	1,790
Argentine Republic ..	244,627	78,316	45,452
Other Foreign Countries	135,630	58,647	40,270
Total	5,304,862	3,357,972	1,134,284

The best showing in the radio section was in transmitters, radio communication and navigational aid equipment (including radar), with a value of £330,977 compared with £99,557 a year ago. As in February, exports of domestic receivers were on a reduced scale. Accumulators, cooking apparatus and house-service meters are three categories showing substantial advances. With regard to the last, the total *number* exported in the first three months of the year was 181,268 compared with 41,334 in 1938 (quarter of the yearly total).

Analysis of the figures given in Table II brings to light some interesting trade developments. Goods and apparatus sent to China, for example, have reached a value so far this year of £447,060 compared with only £12,350 in a quarter of 1938. South American markets are also yielding good results and in the case of Argentina, the figures for the past three months have been £48,052, £140,761 and £244,627.

In each of the main classes of electrical machinery, exports were greater than a year ago both in volume and value, in spite of a sharp contraction in the amount sent to Russia (apart from motors, for which figures are not given, the reduction exceeded £400,000 compared with a year ago).

Imports of electrical equipment amounted in value to £375,083 and the principal supplier, as before, was the United States. Some curious contrasts are recorded for the past quarter in numbers and values compared with 1938:—Furnace carbons, 38,590 (£77,081) against 71,000 (£12,162); other carbons, 248,843 (£14,549) against 38,742,000 (£6,903); and lamp bulbs 981,325 (£21,464) against 13,127,877 (£30,794).

Laboratory Lighting

AMONG the classroom lighting installations recently carried out by the British Thomson-Houston Co., Ltd., that in the biological laboratory of the Lawrence Sheriff Preparatory School, Rugby, is noteworthy. Previously, lighting was by eight fittings, each with a 100-W tungsten filament lamp. The new installation has been planned to provide adequate general lighting which is supplemented by upward light from fittings arranged continuously along the benches, primarily for microscopic work, and the blackboard is locally illuminated. "Mazdalux" F177 fittings are arranged in a continuous line over the centre of each row of benches at a height which allows the student an unobstructed view of the board and at the same time fully illuminates the surface of the benches; each of these is for use with one 80-W, 5-ft fluorescent lamp. The majority of the light is directed downwards, but open tops permit a certain amount of upward light. This greatly assists in dissecting and microscopical work. Two "Mazdalux" F225 fittings are mounted flush to the ceiling. Illumination for the blackboard is provided by a "Mazdalux" F533 fitting, specially designed for the lighting of vertical surfaces.

ELECTRICITY SUPPLY

Llanelly Suction Pipe Damaged. Wallasey Inquiry.

Devonshire.—NEW POWER STATION.—Sir Alexander Gibb & Partners are the consulting engineers for the civil engineering works in connection with the new power station to be built at Yelland Marsh for the British Electricity Authority, South Western Division.

Douglas (I.O.M.).—COST OF NEW PLANT.—The Corporation has received tenders for plant in connection with the proposed extensions to the generating station. These include the supply of one 5,000-kW turbo-generator and two boilers each of 60,000 lb/hr capacity amounting to £62,984 and £233,646 respectively, a total of £296,630 and to this figure must be added the cost of buildings, piling, chimney, cooling tower, circulating water pipes, transformers and switchgear which is estimated at £103,400, making a total of £400,030.

Llanelly. — DAMAGE AT POWER STATION. —A 7,500-kW generator was put out of commission at Llanelly power station on 22nd April as a result of what Mr. E. J. Davies, harbour superintendent, believed to be a deliberate act. A metal flange weighing about 120 lb was rolled over the quayside on to an underwater suction pipe feeding the condensers of the generating station. The pipe was holed, necessitating an immediate closing down of part of the plant. This resulted in a loss of nearly 50 per cent production, and the station could not work at normal capacity for several days. Mr. Davies thought the damage was done deliberately, because the flange had been rolled 30 yd to the dockside, and part of the quay guardrail had been removed to clear a passage for it to be toppled into the dock.

Newport (Mon.).—WORK ON POWER STATION SITE.—The *South Wales Argus* reports that preparatory work has begun on the site of the new power station at the mouth of the River Usk. A hundred men are engaged in levelling the Station " A " site. Ballast is being brought from the Ely and Nantgwyn colliery tips to raise the site the required amount above flood level. Work is also proceeding on a 24-ft wide access road. The first part of the scheme is estimated to cost £16·5 million and the full two-station project in the neighbourhood of £34 million.

Portishead.—GAS-ELECTRICITY DECISION.—On the grounds that the cost of electricity is too high for many of the tenants, the Urban District Council has decided that 80 per cent of the houses on its West Hill and Down Road estate shall be provided with gas for cooking and heating. The remainder will be " all electric." It was stated that the Ministry of Health had agreed to leave the matter to the Council's discretion.

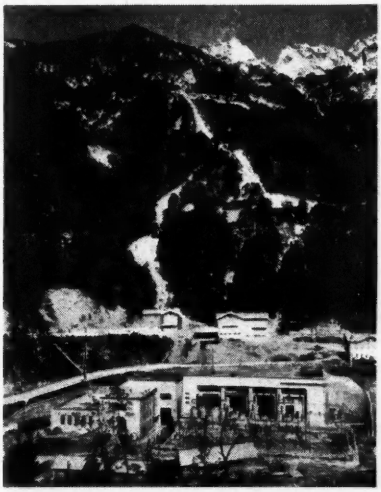
Wallasey.—OVERHEAD LINE INQUIRY.—A Ministry of Fuel and Power inquiry into the Corporation's objection to the proposal of the British Electricity Authority to erect overhead wires between Birkenhead and Wallasey was opened at Birkenhead Town Hall on 28th April. The Wallasey objection is on the grounds that the lines will spoil the amenities of the district.

Overseas

France.—HYDRO-POWER PLANTS RETURNED TO ITALY.—France has restored control of the Moncensio hydro-electric power stations to Italy.

Iraq.—FIVE-YEAR PLAN.—It is proposed to spend £2 million in the next five years on supplying every town and village in the country with water and electricity.

Italy.—NEW HYDRO-ELECTRIC STATION.—The accompanying illustration shows the new power station at Ampezzo, north of Trieste, which was referred to in our issue of 16th April last. The dam is said to be the highest in Europe—450 ft (137 m). About 300 New Zealand prisoners of war were originally employed in the construction of the station which was started in 1941. It uses water from the rivers Lumei and Novarza and will provide power for Trieste, Udine and Venice, thus alleviating the serious lack of power.



General view of the power station at Ampezzo, near Trieste

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1939

E. K. COLE, LTD., and H. A. Brooke.—"Aerial circuit arrangements for multi-wave-range radio receivers." 15625. 26th May, 1939. (600301.)

1940

M. S. Tsypkin.—"Electromagnetic telephone relay." 6800. 15th April, 1940. (600302.)

1941

General Electric Co., Ltd., W. B. H. Lord, L. Rollin, G. M. Tomlin and H. C. Turner.—"Electrical apparatus for the measurment or/and indication of specific intervals of distance." 14703. 12th June, 1941. (600351.)

1943

Sperry Gyroscope Co., Inc.—"Radio apparatus for object location." 1505. 19th May, 1942. (600502.)

British Thomson-Houston Co., Ltd. (General Electric Co.).—"Electronic apparatus for the transmission of a signal during the interval between succeeding electrical impulses." 11873. 21st July, 1943. (600452.)

Standard Telephones & Cables, Ltd.—"Adjustable transmission line." 17461. 12th May, 1942. (600352.)

1944

Standard Telephones & Cables, Ltd.—"Phase adjuster for electric circuits." 3575. 27th February, 1943 (600353). "Telecommunication systems." 7992. 21st June, 1943. (600458). "Electrical sawtooth wave generating system." 10102. 23rd January, 1943. (600459). "Radio detection system." 10303. 29th May, 1943. (600313.) "Telecommunication switching systems." 14672. 28th August, 1943. (600504.) "Electrical apparatus for testing metals." 22063. 9th November, 1943. (600467.)

National Cash Register Co.—"Calculating or like accumulators comprising electronic devices." 9742. 26th September, 1941. (600503.) "Electron discharge devices." 9754. 3rd June, 1943. (600311.) "Communication systems and apparatus." 9755. 15th October, 1943. (600312.)

General Electric Co., Ltd., and S. V. Williams.—"Manufacture of tinplate." 11197. 12th June, 1944. (600461.)

Imperial Chemical Industries, Ltd. (E. T. Du Pont de Nemours & Co.).—"Electric condensers." 23786. 29th November, 1944. (600409.) "Electric condensers." 23792. 4th October, 1943. (600410.) "Electric condensers." 23794. 15th October, 1943. (600411.)

W. F. Flemington. "Tubular electric water-heaters." 24990. 13th December, 1944. (600506.)

1945

Submarine Signal Co.—"Submarine signalling systems." 1540. 13th May, 1940. (600472.)

National Cash Register Co.—"Electronic calculating apparatus. 2189. 27th January, 1944. (600508.)

Western Electric Co., Inc.—"Wave filters." 7097. 23rd March, 1944. (600320.)

Philco Corporation.—"Mathematical squaring device of the electron tube type." 8719. 11th August, 1944. (600511.)

Soc. Le Carbone-Lorraine.—"Brushes and sliding contacts for electric machines." 10264. 20th May, 1942. (600321.)

Soc. Anon. des Ateliers de Sécheron.—"Coated electrodes for electric welding and processes for their manufacture." 13840. 16th August, 1944. (600482.)

A. Harrison.—"Apparatus for measuring short time intervals electrically." 13927. 2nd June, 1945. (600514.)

Radio Corporation of America.—"Thermionic high-frequency generating system." 14407. 12th July, 1944. (600324.)

F. Caplin and J. H. Bagley.—"Radio direction finding installations." 14458. 7th June, 1945. (600483.)

Marconi's Wireless Telegraph Co., Ltd.—"Directive antenna." 18341. 22nd January, 1944. (600327.)

Philco Radio & Television Corporation.—"Wide band interstage coupling network." 18877. 10th January, 1944. (600515.)

Best Products, Ltd., and F. L. Best.—"Electric immersion heaters." 19478. 30th July, 1945. (600416.)

F. Heaton, A. R. Heaton and J. M. B. Heaton.—"Electromagnetic solenoids." 20134. 6th August, 1945. (600360.)

British Thomson-Houston Co., Ltd., J. Moir and W. S. Graff-Baker.—"Stabilization of current voltage power supplies." 21333. 21st August, 1945. (600516.)

G. M. Horvitch.—"Electrical means for indicating sound pitch or voice inflection." 23100. 7th September, 1945. (600336.)

N. C. Barford.—"Electron discharge amplifiers employing hollow resonators." 23333. 10th September, 1945. (600493.)

General Electric Co., Ltd., V. J. Francis and E. H. Nelson.—"High pressure metal vapour electric discharge lamps." 24682. 24th September, 1945. Cognate applications 32398/45 and 18427/46.) (600495.)

Ferranti, Ltd., and H. Wood.—"Thermionic valve oscillators." 24794. 25th September, 1945. (600496.)

F. J. M. Theunissen.—"Automatic circuit-breakers." 25112. 17th October, 1944. (Addition to 599407). (600421.)

F. Christensen.—"Impulse generators." 25498. 3rd October, 1944. (600375.)

Marconi's Wireless Telegraph Co., Ltd.—"Radio frequency transmission lines." 25766. 29th March, 1943. (600422.)

Siemens Bros. & Co., Ltd., and K. R. Yates.—"Automatic telephone systems." 26033. 5th October, 1945. (600423.)

Telegraph Construction & Maintenance Co., Ltd., Dunlop Rubber Co., Ltd., J. N. Dean and G. Vaughan.—"Manufacture of strengthened fibrous cord and the like." 26035. 5th October, 1945. (600424.)

Western Electric Co., Inc.—"Apparatus for matching impedance." 26052. 14th October, 1944. (600519.)

Philips Lamps, Ltd.—"Electric discharge tubes with deflection control." 26313. 15th August, 1940. (600429.)

Aktiebolaget Elektrolux.—"Cooling chambers, refrigerators or the like." 26725. 6th November, 1944. (600382.)

J. P. Wykes.—"Superheterodyne radio and like receivers." 26810. 13th October, 1945. (600384.)

Imp Radio, Ltd., J. Black and W. T. Riley.—"Electric plug adaptors." 27490. 19th October, 1945. (600338.)

M-O Valve Co., Ltd., and D. Andrews.—"Detachable unions in tubes for cooling electric discharge devices." 29131. 2nd November, 1945. (600529.)

A. E. Tyerman.—"Electric cookers." 29450. 6th November, 1945. (600388.)

Soc. Anon. des Ateliers de Sécheron.—"Single drive for axle with cardan shaft and gearing for electrically propelled vehicles. 29569. 20th November, 1944. (600389.)

D. Naerbo.—"Automatic signalling apparatus for street crossings and the like. 29619. 7th November, 1945. (600435.)

English Electric Co., Ltd., and K. F. Barlow.—"Electric billet heating machines. 29668. 7th November, 1945. (600436.) "Electric billet heating machines." 30795. 16th November, 1945. (600438.)

Naamlooze Vennootschap Fabriek van Electrische Apparaten Voorheen F. Hazemeijer & Co.—"Electric circuit-breakers." 30732. 21st June, 1941. (600390.)

Brookhirst Switchgear, Ltd., and W. R. Chalmers.—"Electric switches, switchgear and the like adapted for sparking prevention." 31725. 24th November, 1945. (Cognate application 18660/46.) (600344).

Soc. Génévoise d'Instruments de Physique.—"Telecontrol mechanisms for the feed and rotation speeds of drilling, boring or other machine-tool spindles. 32798. 22nd December, 1944. (600345.)

D. G. I. Hitchman and F. H. Schofield.—"Combined

brightness and colour pyrometer of the disappearing-filament type. 34350. 18th December, 1945. (600440.)

N. E. Hewitt.—"Projection lamps." 34685. 21st December, 1945. (600442.)

1946

Bisset Industries, Ltd., and R. S. Lees-Andrews.—"Snap-action electric switches." 10823. 8th April, 1946. (600545.)

Sperry Gyroscope Co., Inc.—"Radio object detecting systems." 12480. 19th May, 1942. (Divided out of 600502). (600546.)

Crompton Parkinson, Ltd., and T. S. Jones.—"Lampholders." 19136. 26th June, 1946. (600349.)

1947

W. E. Bradley, F. A. Driver and E. L. Tinley.—"Indicating or control devices for steam generators and other vessels for containing liquids." 14619. 23rd August, 1944. (Divided out of 597639). (600450.)

Amended Specification

553846. Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.).—"Electron discharge devices."

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—N.S.W. Railways. 2nd June. Fourteen 132-kV and seven 66-kV outdoor type circuit breakers. (Spec. 1196 and 1197 respectively.)

9th June. Two 6,000-kVA, two 44,000-kVA and two 55,000-kVA transformers. (Spec. 1199, 1200 and 1201.)

16th June. Four 76-kV arc suppression coils. (Spec. 1198.)

23rd June. Four water-tube boilers for Lake Macquarie power station. (Spec. 1194.)

Docking.—22nd May. Rural District Council. Electrically driven borehole pumps for a new pumphouse at Great Bircham. Sir Cyril Kirkpatrick & Partners, Chandos Court, Caxton Street, Westminster, S.W.1.

Halifax.—3rd May. Housing Committee. Electrical work in connection with the scheme for 54 houses at Cousin Lane, West Side. Borough engineer, Crossley Street.

Inverness.—17th May. Town Council. Electrical work at Dalneigh housing scheme (118 houses).—Schedules from J. Blackburn, burgh architect, 11, High Street.

Leeds.—10th May. Corporation Waterworks Department. Portable generating set, meter testing mrchines, electric motors, electric drills, and electrically operated petrol pumps. K. L. Forster, general manager, Civic Hall.

Manchester.—8th May. B.E.A. North Western Division. Supply and installation of batteries, chargers and mercury arc rectifier, and removal of existing batteries, at Stuart Street station. (23rd April.)

Newbiggin (Northumberland).—U.D.C. Electrical work in connection with the erection of twenty-four houses in Woodhorn Road. Plans are by the surveyor.

New Zealand.—Wellington. 15th June. State Hydro-Electric Department. One 50,000-kVA, 110/22-kV T.C.O.L. transformer bank and spare unit (Contract No. 86), three 30,000-kVA, 22-kV voltage regulating transformers (Contract No. 87), and one 22-kV current limiting reactor (Contract No. 88), for Penrose substation.*

13th July. 10,000-kVA synchronous condensers for Stoke substation. (Con. 85.)

27th July. Two 30,000-kVA synchronous condensers for Haywards substation. (Con. 84.)

South Africa.—20th May. Johannesburg. Railways and Harbours. Mercury arc rectifier traction substation equipment.*

Thetford.—15th May. Borough Council. Three automatic electric pumping stations, for sewerage and sewage disposal works. Elliott & Brown, Stanley House, Pelham Road, Nottingham.

West Riding.—6th May. County Council. Electrical work for conversion of the former isolation hospital at Crossley, Mirfield, to a maternity home. County architect, County Hall, Wakefield.

* Specifications may be inspected at the Export Promotion Department, Thames House North, Millbank, S.W.1.

Orders Placed

Surrey.—County Council. Accepted. Electrical installation in new primary school at Hamsey Green.—Alpha Manufacturing & Electrical Co., Ltd.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aycliffe (Co. Durham).—Houses (200) for Aycliffe Development Corporation; Grenfell Bains Group, architects, Guildhall Street, Preston, Lancashire.

Birmingham.—Day school (£17,500); Rev. J. Crowle Ellis, Vicarage, Church of St. Laurence, Northfield.

Bournemouth.—Houses (104), Kinson estate; borough architect, Town Hall.

Bristol.—Transit sheds, Princes Wharf; N. A. Matheson, chief engineer, Avonmouth Docks, Bristol.

Burnley.—Engineering factory; Harling & Todd, Ltd., Rosegrove.

Chessington (Surrey).—Houses (100), Buckland Road; Walter Stokes (Westlands), Ltd., builders, Roebuck Road.

Childon Colliery (Co. Durham).—Pithead baths for the Miners' Welfare Commission, London.

Dagenham.—Factory and offices, Wantz Lane; Milton Manufacturing Co., Ltd., 7, Haleswell Parade, Finchley Road, N.W.11.

Dudley.—Boiler house; Southerns, Ltd., Pedmore Road.

Elland.—Factory; Edward Sutcliffe, Ltd., maltsters, Station Road, Mirfield.

Fifeshire.—Prefabricated aluminium school Ballingry (£170,000); county clerk, Cupar.

Hindley.—Glass works, Platt Bridge; Co-operative Wholesale Society, Ltd., 1, Balloon Street, Manchester, 4.

Leigh.—Pithead baths and works canteen, Plank Lane, for National Coal Board; J. H. Burton, architect, 16, Oxford Street, Manchester, 1.

Llanelly.—Engineering works at Machynys; Rd. Thomas & Baldwins, Ltd.

Manchester.—Flats, Baguley Hall and Miles Platting (£344,000); A. MacKenzie, housing director, Town Hall.

Factory, Collyhurst, for J. Wilcox & Son; E. E. Costello, architect, 325, Langworthy Road, Pendleton, Salford, 6.

Newcastle (Staffs).—Sheet metal works, Lower Milehouse Lane, for Metalcraft, Ltd.; Hollins, Lones & Oldacre, architects, Lloyds Bank Buildings.

Newcastle-on-Tyne.—Additional temporary dining accommodation for nurses at the General Hospital (£10,000); R. S. Appleby & Co., Ltd., builders, Trafalgar Street.

Northumberland.—Maternity home at Alnwick; county architect, County Hall, Newcastle-on-Tyne.

Rochester.—New factory for Standard Yeast Co., Ltd.; O. N. Arup, Colquhoun House, Broadwick Street, London, W.1.

Salford.—North Salford secondary school for boys; W. Fearnley & Sons (Salford), Ltd., builders, Weaste.

Skegness.—Permanent houses (50), Church Lane; I. M. Cule, clerk to U.D.C., Town Hall.

Stamford Bridge (Yorks).—Factory premises; Derwent Plastics, Ltd., Stamford Bridge.

Stoke-on-Trent.—Tile works, Chatterley, for R. Powell; A. Cotton, Son & Richards, architects, Piccadilly, Tunstall.

Extensions for Bentley Tileries, Ltd., Bradwell Wood, Tunstall.

Wallasey.—Secondary school for girls, Rake Lane, for Catholic authorities; F. X. Velarde, architect, 1, Abercromby Square, Liverpool, 1.

Weardale (Co. Durham).—Development scheme near Westgate including stone crushing plant, tarmacadam plant and lime kilns (£100,000); Whitaker & Sons, quarry owners, Leeds.

West Bromwich.—Factory for Copper & Alloys, Ltd., 9, Greets Green Road.

Extensions to Albion Strip Works for J. B. & S. Lees, Ltd.; C. E. M. Fillmore, architect, 270, High Street.

Trade Marks

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered within a month from 21st April:—

BROWN, BISLEY (design). No. B652,385, Class 9. Bells, conduit materials, contact devices, distribution boxes, door openers, fire alarms, flat irons, switches, metal terminals and kitchen utensils included in Class 9, all being electrical goods.—F. C. Brown, Queen's Road, Bisley, Surrey.

DULCI. No. 653,351, Class 9. Radio receiving sets (complete), battery eliminators, microphones, short-wave adaptors for wireless, electric bells and transformers therefor, and morse tapping keys.—Dulci Co., Ltd., 97-99, Villiers Road, Willesden, London, N.W.2.

WILMAY. No. B657,544, Class 9. Electric flat irons.—Wilkins Garages, Ltd., Whins of Milton, Stirling.

MICOVAC. No. 657,984, Class 9. Measuring instruments, and testing instruments (other than medical or surgical purposes), all being electrically operated.—Electronic Instruments, Ltd., 17, Paradise Road, Richmond, Surrey.

MICROTA. No. 658,111, Class 9. Electric switches.—Simplex Electric Co., Ltd., Broadwell Road, Oldbury, near Birmingham.

TAPIR BRAND (design). No. 652,759, Class 11. Electric lighting fittings, but not including lampshades or any goods of the same description as lampshades.—Clifford McMullan & Co., Ltd., 36, Bedford Street, Belfast.

UNOMAC. No. 654,904, Class 11. Electric light fittings, lampholders, lamp brackets, lamp pendants, electric fires and heaters.—Arthur Macfarlane & Co., Ltd., Scottish Industrial Estate, Earl Haig Road, Glasgow, S.W.2.

TERNEX and design. Nos. 655,947-8 respectively, Class 11. Electric lamps and fittings therefor included in Class 11.—Henry & Farthing, Ltd., 33-37, Bell Street, Edgware Road, London, N.W.1.

DENFIX. No. 657,730, Class 17. Polystyrene varnish and cement, all for electrical insulating purposes.—Denco (Clacton), Ltd., 355-9, Old Road, Clacton-on-Sea.

ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E.
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7th May, 1948

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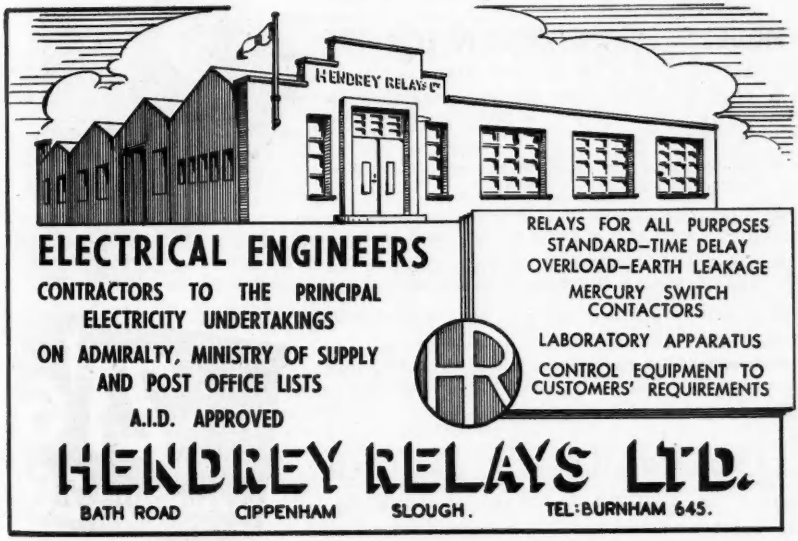

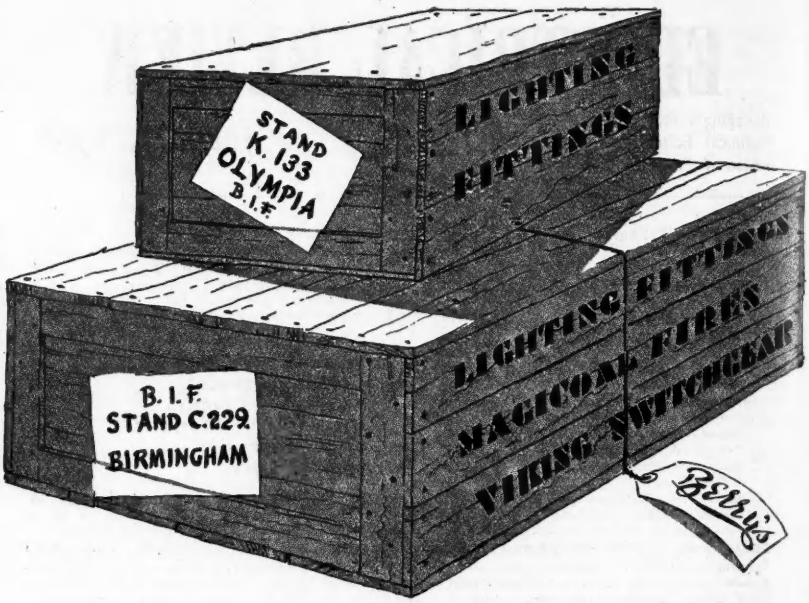

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